The Government's Roles to Regulate Private Participation in Transportation Infrastructures and Services in Korea

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Abstract

This thesis is to review lessons from worldwide experiences of privatization process for government's roles to regulate private participation in transportation infrastructures and services, to analyze current situation in Korea in context of privatization focusing on managing demand forecasts risks to deal with possible optimistic behaviors in the public and private sector under the generous government income guarantee mechanism through comparison with the case in UK, and to suggest strategic implication for the government to achieve service quality improvement from efficiency and creativity as well as expansion of transportation infrastructure and services from private participation.

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Table of Contents

List of Tables

List of Figures

Executive Summary

In Korea, since 1994, policy decisions have been taken to introduce private capital in infrastructure with a concession scheme to alleviate its budgetary restriction of the government and allow more public resources to be devoted to other social spending as well as to achieve creativity and efficiency from private sector. Since then, actual private fund investment has increased to occupy 9.6 % of total infrastructure investment in 2002. On one hand, such quantitative expansion of private fund investment has been appraised in terms of attenuating budgetary limitation, and on the other hand, qualitative results of have been on debate due mainly to optimistic demand forecasts in hindsight and generous revenue guarantee as a reason.

In this regard, the government should understand strategic optimism of public sector about demand forecasts. Under competitive process of public fund allocation selecting some projects among a lot of projects proposed, the use of strategic optimism as tactics in power struggles for getting a project started seems to best explain why demand forecasting are systematically overestimated. And when the forecast is poorly estimated, it can lead to a considerable misuse of resources otherwise can support other feasible projects.

One of solution to deal with strategic misuse of demand forecasting is involvement of private participation at the risk of private investment. Indeed, actual regulatory regimes for demand risk allocation and incentives vary significantly from one country to another. Among them, shadow toll mechanism in the UK transfers demand risks to private participants and give higher incentive to them. The concession company make its own demand forecast endogenously at the risk of its investment. The minimum guarantee mechanism in Korea makes traffic risks be retained by the government and gives lower incentive to private participants. In Korea, the preliminary feasibility studies and detailed feasibility studies are done by exogenous entities such as public institutes rather than by a concessionaire.

The argument is not to imply that the shadow toll mechanism is superior to minimum revenue guarantee mechanism. Both systems have their own advantages and disadvantages and selection and implementation of the regulatory regime could be based on unique situation of a country. Nevertheless, in Korea, the success of the project depends primarily on accuracy of demand forecasts from the public institutes and government's guarantee of up to 90% of expected revenue significantly reduces incentive of private firms to screen the demand forecasts due to certain confidence of future revenue to the degree of government guarantee allowed.

Then, theoretically, the current minimum guarantee mechanism in Korea can be improved in two ways. The first is to reshape the total revenue curve similar to that of shadow toll mechanism. This leads to increase incentive for a concessionaire to screen the project feasibility at the risk of its investment, and also decrease the budgetary burden for the revenue guarantee. The second is to improve the accuracy of demand forecasts done by public institutes, making competitive environment with introducing other private institute and private firms in the market. This option is exogenous method and is not as powerful and reachable as endogenous way such as the first option

Chapter 1. Introduction

1-1. The objective of the thesis

Korea has experienced rapid economic growth rate for more than decades. And, with the economic expansion, demand for basic infrastructure services has outstripped the supply capacity of exiting assets, which results in infrastructure deficits. If not eliminated, these deficits could create serious obstacle to further economic growth as well as economic and social inequality leaving certain segments of the population isolated from the benefits of the economic development. Therefore, since 1994, policy decisions have been taken to introduce private capital in infrastructure with a concession scheme to alleviate its budgetary restriction of the government and allow more public resources to be devoted to other social spending.

With this regard, the government made several long-term investment plan in infrastructure during 2000-2020 to catch up with the increasing demand in the sector, and, based on them, made a updated mid-long term private fund investment plan during 2002-2011. Since 1995, the total 128 projects have been announced as PPI projects. Among them, 83 projects (65%) have found private participants and 27 projects (21%) are under operation, then the actual private fund investment has increased to occupy 9.6 % of total infrastructure investment in 2002. And the government also made the list of future PPI projects as a reference to manage the future PPI projects, which consist of 179 projects with total cost estimate of 63 trillion Won.

On one hand, such quantitative expansion of private fund investment has been appraised in terms of attenuating budgetary limitation and following allowance of investment in other social sectors, and on the other hand, qualitative results of PPI projects have been on debate mainly from too generous revenue guarantee to concession companies. If not properly managed, these problems will be likely lead to unexpected budgetary expenditure and burden on taxpayers in the future, even though it is just in the beginning stage of performance of some PPI projects implemented, and one cannot rule

out possibility of improvement under the revenue guarantee regime unchanged.

So, this thesis is to review lessons from worldwide experiences of privatization process for government's roles to regulate private participation in transportation infrastructures and services, to analyze current situation in Korea in context of privatization focusing on managing demand forecasts risks to deal with possible optimistic behaviors in the public and private sector under the generous government income guarantee mechanism through comparison with the case in UK, and to suggest strategic implication for the government to achieve service quality improvement from efficiency and creativity as well as expansion of transportation infrastructure and services from private participation.

1-2. The structure of the thesis

Chapter 1 (Introduction) provides the objective and structure of the thesis.

In chapter 2 (the government's roles in private participation in infrastructure), fruitful lessons from worldwide experiences about privatization are reviewed in empirical and theoretical way focused on the roles of the government to regulate private participation in infrastructure. In details, based on various studies on such issues, setting the objective of privatization, creating competition to manage monopoly issue, identifying and allocating various risks and providing correspondent incentives, arranging regulatory regime to manage price and quality of services, and organizing concession contract are reviewed.

Chap3 (Private Participation in Infrastructure in Korea) describes current situation in Korea in context of privatization. First, the objective of introducing and facilitating private participation in infrastructure is discussed with perspective of catching up with increasing infrastructure demand and alleviating budgetary burden through private fund investment, and allocating the savings to other sectors. Second, the legal frame is introduced. Finally, implementation status of 128 projects

announced as PPI projects so far is introduced in details and also long term infrastructure investment plan through private participation is discussed with potential PPI project list.

Some undesirable drawbacks appeared in the implementation of the projects, as well as successful expansion of private fund investment in the field, are discussed. Among them, generous government revenue guarantee is considered as one of the ultimate problems to be solved to manage optimistic demand forecasts as shown in some large toll concession roads under operation.

Chapter 4 (Demand forecasting and risk allocation in transportation infrastructures) focuses on issues on demand forecasts. It shows that overestimated demand forecasts and cost overruns in large infrastructure projects are common, the unbiased failure implies possible strategic optimism from public and private sector due mainly to competitive environment to get a given project selected and started, and involving private participation at the risk of recovery of the private investment could be a solution to deal with the strategic optimism. It also argue that revenue guarantee could reduce incentives to screen feasibility of a concession project through comparison with shadow toll mechanism in the U.K.

Chapter 5 (Conclusion) summarizes the discussions and suggests several strategic implications for the new government's role to regulate private participation in transport infrastructures and services in Korea.

Chapter 2. The government's roles in private participation in infrastructure

2-1. The Rise of Private Participation

In recent years, the private participation in the transportation infrastructures and services have increased, because the public sector have had difficulty catching up with increasing demand of the infrastructures and providing enough efficiency and creativity to the sector to keep price and quality in certain level. So, private participation has been regarded as an alternative to solve the problems, which have been incurred by the public management. (Estache & Strong, 2000)

There are many forms of private participation in transport, including[1]:

The contracting out of services, where the private sector is contracted to provide services on behalf of the government for compensation, either in terms of a share of revenue, profit, or payments from the government. In general, contracting out does not involve financing risk, although it may involve revenue risk.

Joint ventures, in which the public and private sectors share responsibility for financing and operation of public facilities;

Build, Operate, Transfer (BOT) projects, where the private sector has the primary responsibility for financing, developing, and operating the facility for a fixed period of time, which should be sufficient to both repay debt and provide the required return on investment. At the end of the concession, assets are transferred to the government under terms agreed to in the contract. Perhaps the most familiar form of participation in transport infrastructure, this has been employed in many different variations.[2]

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[1] Estache & Strong, 2000, pp2-3

[2] These include Build-Own-Operate-Transfer (BOOT), Build-Lease-Transfer (BLT), Build-Transfer-Operate (BTO), Design-Build-Finance-Operate (DBFO), and Design-Construct-Manage-Finance (DCMF).

Build, Own, and Operate (BOO), where the private sector obtains the ownership and control of the facilities, with no transfer to the public sector.

Within these broad categories is a continuum of organizational forms for private participation in which the risk level taken on by the private sector increases until it gets fully assumed. Project finance and regulatory issues arise generally from the organizational forms organized around concessions, franchises, and variations of Build-Operate-Transfer (BOT) projects with or without concessions. (Estache and Strong, 2000, p3)

< Forms of Private investment projects in Korea >

Based on the Act on Private Participation in Infrastructure in Korea, private investment projects can be conducted in one of the following methods:

• *BTO (Build-Transfer-Operate):* Ownership of the infrastructure facilities is transferred to the State or local government upon completion of construction, and the concessionaire has the right to operate the infrastructure facilities for a specified period of time;

• *BOT (Build-Operate-Transfer):* The concessionaire assumes ownership of the infrastructure facilities for a specified period of time after completion of construction, and the ownership is transferred to the State or local government upon the termination of the concession period;

• *BOO (Build-Own-Operate):* The concessionaire owns and operates the infrastructure facilities upon completion of construction;

• *BLT (Build-Lease-Transfer):* Upon completion of construction of the infrastructure facilities, the

concessionaire leases the facilities to the government for a period of time and upon termination of the lease the ownership then is transferred to the State or local government;

• *ROT (Rehabilitate-Operate-Transfer):* Upon rehabilitation of the existing infrastructure facilities owned by the State or the local government, the concessionaire has the right to operate the facilities for a specified period of time;

• *ROO (Rehabilitate-Own-Operate):* Upon rehabilitation of the existing infrastructure facilities, the concessionaire owns and operates the facilities; and

• Other methods in the instruction for proposal for private participation in infrastructure as proposed by the competent authority under Article 10 of the Act on Private Participation in Infrastructure.

2-2. The government's roles in private participation in infrastructure

In many countries, transportation infrastructures and services have been managed by the public sector with budgetary fund. But, the public management has resulted in inefficiency, lack of creativity, extraordinary lifecycle costs. And this generally leads to undesirable price and quality problems against users and tax burden to taxpayers. In addition, increasing demand of budget toward other sector such as social welfares, make it more difficult to finance the transportation infrastructure with budgetary funding. These problems have encouraged increasing private involvement in the sector to achieve creativity and efficiency from private entities. Nevertheless, this implies that the government needs to assume new responsibilities to regulate the privatization process, rather than that the government is no longer needed. (Estache & de Rus, 2000)

2-2-1. The government's objectives of privatization

It is important that the government understands its objectives in pursuing privatization because these objectives will direct all activities undertaken; most importantly perhaps the objectives should affect the regulatory decisions.

The government's objectives of introducing private participation can have an important impact on the pace of network expansion and quality improvements. For example, if a government places priority on keeping tariff in certain level, it could need government support and lead to lack of fund available, hence slow the expansion and improvement of the service. On the other hand, if the government places a priority on expanding access, allowing enough recovery of investment to catch up with real costs with user-pay principle, it could lead to further expansion of network with new resources saved by the scheme (Gary, 2001).

In the context of privatization, Estache & de Rus emphasize that the government have multiple objectives such as efficiency for minimizing costs, fairness for guaranteeing reasonable return on private investment, reducing fiscal deficit, minimizing political conflict, control prices and service quality from monopolists, creating competitive environment. When an objective dominates the others, it can reduce the scope for another objective, so regulator should make the consequences of these multiple objectives as transparent as possible (Estache & de Rus, 2000).

2-2-2 Regulation of monopoly and competition

Most infrastructure sectors were once considered to be "natural" monopolies, in the sense that a single firm could supply a market at least cost. However, advances in technology and in economic thinking have shown that competition is not only feasible but also desirable in a growing number of industry segments including transport services. Competition is a powerful driver of efficiency, create strong incentives for improving service and can help to reduce the regulatory burden. Even

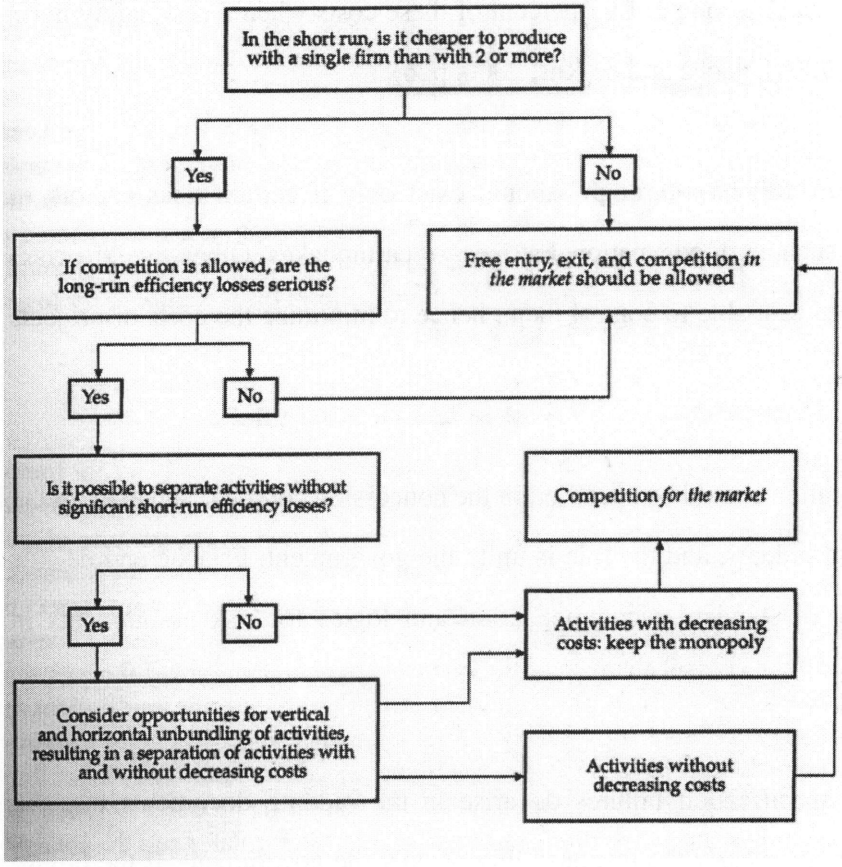
when *competition in the market* is not feasible, some of its benefits can be achieved by introducing *competition for the market*. Under this approach, time-bound monopoly franchises are awarded by competitive bidding and periodically re-bid. This helps to ensure countries get the best deal available from private firms, including in terms of investment commitments, and provides incentives for firms to perform well to retain the franchise. (Gary, 2001, pp6-7)

Competition in the market guarantees free entry and exit and lets demand and supply determine prices and quality mixes. Although introducing quality standards is often useful, this can be done without altering the nature of competition. This form of competition is effective in ensuring the long-run sustainability of efficiency gains. *Competition for the market* is organized through an auction used to force potential monopolists to compete with each other for the right to be the single provider of a service. The challenge is to design the auction to ensure that it forces the bidders to pass on many of the efficiency gains they should be able to achieve to the users, and to achieve results similar to those that would be achieved through competition in the market. (Estache & de Rus, 2000, p12)

Estache and de Rus (2000) also provide the Figure 1 that shows the logic to follow to assess what type of competition is desirable and to map the type of competition. Indeed, if competition in the market cannot work, competition for the market can be quite effective to obtain efficiency from a monopoly. In the Figure 1, activities could be divided into infrastructure and superstructure vertically (for instance, road is infrastructure, gas station is a superstructure). It starts with a rather simple question: is it cheaper to produce with a single firm than with more firms? In practice, the short-run concerns tend to dominate the longer-run needs of future generations. If two or more companies can do better than a single firm, interfering with competition in the market is not necessary. Then, if short-run gains are not particularly impressive compared with long-run gains, monopoly is not a viable option and competition should be prepared. A first way to push for competition is to separate infrastructure and superstructure vertically. This provides an opportunity to introduce competition in some specific activities. Horizontal separation also can help: for

instance, this means separating passengers and freight in rail services. Competition still has a role to play once the activities have been sufficiently separated and the remaining natural monopolies have been identified. Competition for the market allows the regulator to get efficiency gains in the sector under monopoly.

Figure 1. Natural monopoly and competition



Source: Estache & de Rus, 2000

2-2-3 Risk identification and allocation

One of the important principles of risk identification and allocation in private participation in infrastructure is to make project participants that controls or is best able to manage the risks to bear them, which is responsible for the government to regulate the privatization process.

Identifying the various types of risks, and their distribution across the various agents, is important because it influences the incentives these various agents will have to behave in one way or another on regulatory matters. For instance, if a concessionaire is allowed to pass through all increases in costs because of changes in safety legislation, it will have little incentive to pick the most cost-effective technologies, because it does not bear the costs of its choice. This is why the British airport regulator only allowed a pass-through of 95 percent of these costs when a new safety norm was introduced for airports in 1996 (Estache and de Rus, 2000, p26).

Kerf and others also argue that "full pass-through" should exist only if certain risks are out of control of private participants, such as floods, national strikes, or earthquakes. Otherwise, the risks should be allocated to the parties best able to control them, hence to minimize the costs of projects given (Kerf et al, 1997).

The risk identification and allocation should be specified in the concession contract, and even in the draft transmitted to the potential bidders, and the role is up to the government. Estache and de Rus (2000) provide brief summary of standard recommendation and logics for risk assignments in concession contracts as follows:

• During the design stage, if specification failures do arise in the bidding documents that the governments provides, and they are clearly the responsibility of only the government. If the failure is in the design proposal as part of the bids provided by the bidder, it is the bidder's fault.

• During the construction stage, legal changes or difficulties and delays in expropriations of land can increase the costs of a project, but the contractor is generally not responsible. The government or an insurance company should thus cover this risk. Construction difficulties caused by technical failures in the choice of material or equipment are, of course, the constructor's responsibility.

• During the operational stage, cost risks should be the operator's responsibility unless cost overruns are due to the government's failure to deliver on a specific commitment that results in cost increases. Revenue risks should also be the operator's responsibility unless the contract specifies otherwise, or when the failure to generate the expected revenue is the result of a government action

Indeed, the actual risk sharing practiced between concession companies and public authorities vary significantly from one country to another as shown in the Table 1 that includes analysis of actual risk sharing for road concession contracts in Europe. Diversity of actual risk identification and allocation is also shown in the two examples attached in the Annex 1 and Annex 2.

Table1: Analysis of risk sharing for road concession contracts in Europe

	Force majeure	Technical risk	Commercial risk*	Financial risk**	Concession company remuneration
England	#	Δ	•	Δ	Shadow toll
Austria	#	Δ	Δ	Δ	Toll
Belgium	#	Δ	Δ	Δ	Toll
Spain	#	Δ	Δ	Δ	Toll
Finland	#	Δ	•	Δ	Shadow toll
France	#	Δ	Δ	Δ	Toll
Greece	#	Δ	Δ	Δ	Toll
Italy	#	Δ	Δ	Δ	Toll
Norway	#	#	Δ	Δ	Toll
Netherlands	#	#	•	Δ	Shadow toll
Portugal	#	Δ	Δ	Δ	Toll

* tariff×traffic risk in the case of tolled section or traffic risk in the case of shadow toll

** not taking account of any State guarantee

Legend: #: Risks borne by the government concession authority

•:Risks borne by the concession company, but substantially supported/limited

Δ: Risks borne by the concession company

Source: French Highway Directorate (1999)

2-2-4 Selection of regulatory regime for price and quality control[3]

Estache and de Rus (2000) argue that the regulator has two objectives: the first to ensure that the operator gets a reasonable rate of return on investment and hence to ensure that investment actually takes place, and the second to make sure that this return is not excessive and hence to ensure that the operator with monopoly power does not abuse the power and to ensure that the users benefit from better price and quality of the service. These objectives can be achieved in many ways. The two extremes are rate of return regulation and price caps and the other options tend to be hybrid solutions as explained as follows:

Rate of return regulation

Until recently, the main approach to monopoly regulation was the control of maximum rate of return allowed from investment. It is essentially an indirect way of controlling prices, because prices above the competitive prices will result in an above-normal rate of return of the sector. The allowed rate of return determines the allowed profits of the firm, as illustrated by equation

(2.1) Allowed rate of return $\times$ *assets value = prices* $\times$ *quantities – operational costs*

This expression implies that a firm will not be interested in the business unless

(2.2) Prices $\times$ *quantities* $\geq$ *operational costs + allowed rate of return* $\times$ *assets value*

The main problem with this indirect form of price regulation comes from perverse incentives built into equation 2.1 and 2.2. The larger the value of the asset, the larger the benefits allowed, and hence the higher the prices will be. This can result in an incentive to over-invest (the Averch-Johnson effect), or simply to overstate the value of the assets when their correct value is difficult to

[3] Except information about Korea, this chapter is directly quoted from Alexander et al, 1999 an Estache and de Rus, 2000, pp30-35

assess precisely. In addition, the equation 2.2 shows that the operator does not have much incentive to cut costs, because the larger the costs, the larger the benefits allowed.

In terms of quality of services, under rate of return regulation, over-investing in quality may be a rewarding strategy for private investors. A limit to over-invest clearly exists. This limit is determined by the interaction between price levels and quality on the one hand and willingness to pay on the other. For instance, a toll road concessionaire may have an incentive to over-invest in road quality, but only to the extent that the resulting toll level is consistent with the overall willingness to pay for road services and with the risks implied by the existence of competition in the form of alternative modes or routes.

These problems have led some regulators to adopt adjusted versions of the rate of return approach, allowing the operator to share in the profits resulting from cost or price reduction, and generating a significant increase in demand.

Rate of Return Regulation of Tariff in Korea

In Korea, the tariff was controlled by rate of return regulation. Under the Act on Inducement of Private Fund in Infrastructure (1994), one of the main issues was that the formula about the tariff calculation as follows:

(2-3) *Present Value (PV) of construction cost (CC) + 10% of PV of Construction Cost (CR)* = PV of operation revenue (OR) + PV of operation cost (OC) + PV of ancillary revenue (ANR)*

With this formula, the tariff was controlled by rate of return. However, CR* unfamiliar in the normal rate of return formula for tariff control was on debate because some argued that it double profit the concessionaire through government's guarantee about profit in construction itself.

So, in the rate of return formula for tariff control, the profit of construction itself was removed in the Act on PPI (1998) as follows.

(2-4) PV of construction cost (CC) = PV of operation revenue (OR) + PV of operation cost (OC) + PV of ancillary revenue (ANR)

This can be described in detail as follows:

$$\sum_{i=0}^{n} \frac{CC_i}{(1+r)^i} = \sum_{i=n+1}^{N} \frac{OR_i - OC_i}{(1+r)^i} + \sum_{i=0}^{N} \frac{ANR_i}{(1+r)^i}$$

n : time of completion of construction

N : time of expiration of concession period or period of ownership and operation

CCi : annual input of the project cost required for the completion of construction of facilities--Government financial support shall be excluded herefrom.

ORi : annual operation revenue (annual operation cash inflow)

OCi : annual operation cost (annual operation cash outflow)

$ANRi$: annual net revenue cash inflow from supplementary project(s); income – expenditure

r : real rate of return of the project

The proposer (a potential concessionaire) shall autonomously suggest the rate of return for agreement on the basis of the expected rate of return considering factors such as investment cost, operation revenue, finance procurement costs, etc. The proposer and the competent authority shall agree upon the rate of return through negotiations.

The following items may be taken into account in determining the rate of return for agreement:

First, the average level of interest rate for borrowing from both domestic and international

financial organizations with respect to infrastructure facilities;

Second, the risk premium after taking into account the risks that can be expected from the project characteristics and its implementation such as the type, scale, security of operation revenue, revenue from supplementary facilities, the level of risk allocated to the Government, etc.;

Third, level of rate of return for similar private investment project cases in domestic and international market. The detailed information about the formula above is in the Annex 4.

Price cap regulation

The UK introduced an alternative to rate of return regulation as part of the privatization of the 1970s and 1980s in various sectors, and it is now becoming common worldwide. It increases the cost incentives and reduces the incentive to over-invest. It is based on the control of maximum prices/the imposition of price caps. The price cap allows an operator to increase its prices with inflation, less a "discount" reflecting all or part of the average increase in productivity (a factor X) in the sector as shown in the equation 2-5. This factor is introduced to ensure that the gains from technological improvements are not simply an increase in the monopoly's profit, but they also benefit the users. In the case of industries with little capital, X can be negative, allowing increases in real prices intended to stimulate new investments or to improve quality of service as imposed by the sector.

(2.5) Price in year 1 ≤ price in year 0 × (inflation – factor X)

Defining price in year 0, if prices were controlled and dramatically subsidized before privatization, the regulator cannot rely on current observed prices because they are probably too low. The regulator must be careful not to be strict on the cap. If the firm cannot cover all costs, including the

risk premium and the real costs associated with bankruptcy, it will enter into renegotiations[4], which are always difficult and may lead to suspension of maintenance and investment. This can be damaging to the network. When the initial conditions are too confusing, relying on best international practice as a first step is often a good option.

Next, the regulator must pick X. When X is set to 0, prices are simply adjusted for inflation, maintaining the real price as a constant. When efficiency gains are expected in the regulated industry, a positive X will lower real prices. This should stimulate the firm to cut costs, and to achieve efficiency gains higher than the industry average. A negative X will increase real prices and the regulator should use it when it wants to promote additional investment in capacity or quality.

Once the regulator has fixed X, it is usually kept constant for four to six years and the regulator does not adjust prices to reflect efficiency gains for the duration. After that period, the regulator revises the X based on observed cost reductions and passes on all or part of these gains to the user by resetting the value of X appropriately.

In terms of quality of services, under a standard price cap regime, a subtle cut in quality can be a tempting way to cut costs because any reduction in quality can lead to cost saving and profits to the concessionaire. So, adjustment of the formula based on quality of service has been adopted in the U.K.

Regulatory regime practiced in selected countries

The actual regulatory regimes established vary from one country to another as well as from one sector to another. Alexander and others provide the table shows an example of three categories of regulatory regime identified as follows:[5]

[4] With this regard, the two examples are on the same basis for ensuring reasonable rate of return
[5] For more detailed information about quantitative risk analysis in financial terms, see Alexander et al, 1999

• high-powered regimes-these are regimes where significant incentives for companies to reduce costs are established through CPI-X type regimes (price-caps, revenue-caps etc.);

• medium-powered regimes-these regimes involve some incentivisation of companies, but normally through hybrid schemes and less explicit regulatory regimes; and

• low-powered regimes-these are basically the standard rate-of-return type approaches to regulation

Table 2: Regulatory regime practiced in selected countries

Regulatory regime	
High-powered	Airports (UK, Australia), Buses (Singapore), Railways (UK), Roads (Australia), and Others (UK)
Medium-powered	Airports (Italy, Denmark, Austria), Buses (UK-London, Australia-Sydney), Railways (Australia), and Roads (Italy)
Low-powered	Buses (Hong Kong), Railways (Argentina, USA, Japan), and Tunnels (Hong Kong)

Source: Alexander et al, 1999

Under traditional rate of return regulation, governments have generally guaranteed to operators that they would recover their costs and get a markup to remunerate investors. Since these regimes do not give a strong incentive to operators to cut costs, they are called low-powered regime. Low powered regimes are also low risk regimes since cost recovery is almost guaranteed.

Under price caps, the regulatory regime could be designed to minimize costs in maximum level. Price caps require the operators to cut the costs and to hence keep the cost saving they were bringing to the sector for a limited period.

In many countries, hybrid systems are approached, which result in some degree of immediate rent sharing at the beginning of the period of private sector operations. These regimes are becoming

increasingly common. Table 2 shows actual regulatory regimes practiced in selected countries.

2-2-5. Financial support from government [6]

There are two main reasons for government to commit to support for project financing (1) to offset the financial or exchange risks by reducing capital expenditures or to improve revenues to the extent necessary for a project to cover debt service and provide a reasonable equity returns; (2) to offset the demand and traffic risk and protect investors (especially lenders) from the risk that actual cash flows and thus be inadequate to cover debt service. When unexpected events arise and a renegotiation of a contract arises, these two are often the main problems a regulator must address. The name of the game is to come up with a mix of government actions that ensures that an acceptable financial return can be generated. These actions may include some redesign of the financing schemes to include guarantees but also of the project design, including its duration.

If public financial support is appropriate, a variety of mechanisms can be used to support private financing. The instruments range from revenue enhancement to equity guarantees.

Equity guarantees. They provide a concessionaire an option to be bought out by the government at a price that guarantees a minimum return on equity. Although the liability is contingent, the government in effect assumes project risk and corresponding private sector incentive are reduced.

Debt guarantees. These guarantee that the government will pay any shortfall related to principal and interest payments. The government may also guarantee any refinancing that is scheduled. It creates significant government exposure and reduces private sector incentives, although it may decrease the cost or increase the amount of debt available to the project.

Exchange rate guarantees. With an exchange rate guarantee, the government agrees to compensate the concessionaire for increases in financing cost due to exchange rate effects on foreign financing. Exchange rate guarantees expose the government to significant risk, as well as increasing the incentive to utilize foreign capital.

Grants/subsidies. Equity and debt guarantees all create contingent liabilities for the government. Alternatively, governments can furnish grants or subordinated loans at project inception, buying down the size of the project that needs private finance. (In Chile, the size of the government grant was one of the criteria used in awarding the South Access toll road concession.) Alternatively, explicit subsidies can be given as part of the renegotiation process. In Argentina, this subsidy took the form of a forgiveness of accumulated payments due to the government for the right to operate the concession. In general, these grants or subsidies have no provision for repayment.

Subordinated loans. Subordinated loans can fill a gap in the financing structure between senior debt and equity. From the government's perspective, they also have the attractive feature that they can be repaid with a return if the road is successful. Subordinated loans improve feasibility by increasing the debt service coverage on senior debt, and by reducing the need for private equity, which requires a higher return. However, because subordinated debt does eventually require repayment, it does not improve project feasibility to the same degree as a similarly sized grant. Another alternative would be for the government to contribute financing that has characteristics of both debt and equity. One such instrument would be a "reverse convertible" contribution that would remain as equity unless the project was successful, at which point it would convert to debt for repayment.

An alternative for the regulator is to pay with the design of the contract. This involved playing with the revenue from toll and with the toll levels and types, with the specification of the investment and other service obligations or with the duration of the contract.

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[6] Except information of Korea, this chapter is directly quoted from Estache & Strong, 2000, pp21-23.

Minimum traffic and revenue guarantees. A minimum traffic or revenue guarantee, in which the government compensates the concessionaire if traffic or revenue falls below a minimum threshold, is a relatively common form of support for toll roads. Typically, the threshold is set 10 to 30 percent below the expected volume and it is generally more desirable to rely on a revenue guarantee if the goal is to facilitate the access of the operator to the financial market. This trigger reduces government exposure while providing sufficient revenue coverage to support the debt component of the capital structure. In addition, traffic and revenue guarantees help retain financial incentives in the project, unless conditions deteriorate well below forecast. If government's share "downside risk" with the private sector through guarantees, they should also consider seeking instruments that allow profit on the "upside". One way to do this is by a revenue-sharing arrangement in which the government receives a portion of revenues above a maximum traffic threshold.

Shadow tolls. One way of providing subsidies is through shadow tolls. Under a shadow toll, the government contributes a specific payment per vehicle to the concessionaire. In effect, it is an ongoing revenue stream from the government in lieu of an up-front grant or loan. Because they are paid over time, they may be less of a burden on the public budget. The drawback of shadow tolls, though, is that they may not provide investors with much protection from revenue risks. That is, shadow toll payments are highest when traffic volumes are large. As a result, government payments may be inadequate to protect investors when traffic is low and may be unnecessarily high when traffic volumes are high. In addition, the payment of shadow tolls over time creates a credit risk for concessionaires. These inefficiencies can be reduced in a number of ways, such as a declining payment schedule as volumes increase or maximum traffic level beyond which shadow tolls are not paid. Because they tend to "top off" private revenues, shadow tolls may be particularly valuable as support to low volumes roads that require upgrading or rehabilitation rather than new construction.

Concession extensions and revenue enhancements. These types of financial support involve limited public sector risk, but also do little to support or enhance private financing. First, a government can extend the concession term if revenues fall below a certain amount. Second, a government can

restrict competition or allow the development of ancillary services by the concessionaire.

Changes in contractual obligations. A final way generally considered by regulators is to allow a redesign of the contractual obligations. Slower or less investments, fewer services obligations, are all ways of cutting costs and transforming a unviable road into a viable one.

In general, the most advantageous types of support for the concessionaire are those which provide early funding streams (when revenues from the toll road are low or non existent during the construction period) and which give guarantees for unexpected problems (for example, exchange rate guarantees). This is true at the time the contract is initially signed but also whenever the regulator is asked to renegotiate to restore financial viability to a project who may have lost it. The least significant are these which themselves are unpredictable i.e., additional rights for development around the road. These various mechanisms of government support can also be used in combination when a project is nor feasible on its own and where revenue risk is substantial. In such cases, grant plus minimum revenue guarantees may be sufficient to induce private participation. Governments should avoid broad guarantees that reduce lenders' scrutiny and due diligence. In many cases, the availability of these guarantees induced lenders to provide funds based on guarantees and sponsor strength rather than underlying project risks and revenues.

Financial support from government in Korea

Based on the Act on PPI (Article 53) and its Enforcement Decree (Article 37), The State or local government may grant a subsidy or long-term loan to the concessionaire within the scope of the budget upon deliberation of the Committee in the following cases:

- When it is otherwise inevitable to avoid dissolution of the corporation;

- Where a subsidy or long-term government loan is inevitable to maintain the tariff at an

appropriate level;

• Where it is difficult to induce private capital due to a decrease in the profitability of the project resulting from a considerable expenditure disbursed as compensation for land;

• Where the actual operation revenue (the amount obtained by multiplying the demand for the concerned facility by tariff) falls considerably short of the estimated operation revenue under the concession agreement, to such an extent that it would be difficult to operate; or

• Where it would be deemed difficult to conduct the private investment project smoothly without a long-term loan or subsidy, while such individual project alone bears low profitability but can increase efficiency such as a considerable reduction in the construction period, cost, etc., when conducted together with other private investment projects as a whole.

"the Private Participation in Infrastructure Annual Plan" that should be announced annually based on the Act on PPI describes the criteria and method for financial support in details as follows.

Financial support to maintain appropriate level of tariff

After the competent authority calculates the computed tariff (level of charges estimated under the assumption that there is no financial support) and the proper tariff (level of charges estimated in comparison with substitute facilities with convenience and competitiveness factors taken into account) for each facility concerned such as road, railroad, harbor, etc., should the computed tariff exceed the proper tariff, the competent authority may provide financial support within the scope necessary to maintain the level of the proper tariff.

Subsidy or long-term loan may be granted to the concessionaire within the scope of the budget for the purpose of land compensation or construction cost, etc. provided, however, that the timing of

the financial support be determined in the concession agreement in connection with the equity investment plan of the concessionaire.

The guarantee of minimum operation revenue and the redemption of excess revenue

Should the actual operation revenue come short of the specified limit of the estimated operation revenue determined in the concession agreement, the tariff may be adjusted or financial support may be provided to compensate for the shortage. Provided, however, that the excess revenue may be redeemed, should the actual operation revenue exceed a specified limit in connection with the guarantee of minimum operation revenue.

The maximum limit on the guarantee of operation revenue may be imposed up to ninety percent (90%) of the estimated operation revenue—eighty percent (80%) for the unsolicited projects. In the case of minimum operation revenue guarantee, when the actual operation revenue exceeds one hundred and ten percent (110%) of the estimated operation revenue—one hundred and twenty percent (120%) for the unsolicited projects according to the guaranteed amount, the State or the local government redeems the excess revenue.

Within the boundaries of the operation revenue guarantee, the competent authority may determine separately the criteria and methods of operation revenue guarantee and government redemption of excess revenue in accordance with the special characteristics and distinctions of each project.

Financial support against exchange rate risk

If, due to the extraordinary fluctuation of the exchange rate, a foreign exchange loss or gain occurs to the foreign currency borrowed by the concessionaire for construction fund (excluding operation fund), the tariff and such may be adjusted to reflect such change, or the State or local government may provide financial support for the foreign exchange loss or redeem the foreign exchange gain.

• Fluctuation range in exchange rate within ± 20%: Concessionaire shall bear the loss (foreign exchange loss) or benefit from the gain as incentive (foreign exchange gain).

• Foreign exchange rate increase of more than 20% (foreign exchange loss): tariff adjustment, etc. or financial support, etc.

• Foreign exchange rate decrease of more than 20% (foreign exchange gain): tariff adjustment, etc. or redemption of foreign exchange gain by the State or local government

The extent of the provisions for tariff modification or government support, etc. due to foreign exchange loss shall be agreed upon in the concession agreement within fifty percent (50%) of the calculated foreign exchange loss. The calculated foreign exchange loss is the loss exceeding over 20% of the entire foreign exchange loss.

In the event of the occurrence of gain and loss in the foreign exchange, the contents, the detailed procedures, and the period of risk sharing shall be agreed upon in the concession agreement.

2-2-6. Organizing concession contract

The contract is the legal instrument spelling out explicitly the key economic elements that the government wants to cover in its agreement with the private operator. To a certain extent, the regulator and government are captive to the concessionaire once the auction has been closed. Once a contract has been awarded, the concessionaire has a significant incentive to negotiate on anything that restricts its profits. So, the coverage of the contract must include a detailed description of the object of the auction, the obligations and rights associated with this object, the process to follow, and contingencies in case of unforeseen events. This is particularly important in countries in which the legal system is not oriented toward contract law. (Estache & de Rus, 2000, p16)

Criteria for an auction and bidding process

Organizing an auction and picking a winner can be done in many ways. Choosing the winner at an auction for a concession or a service contract requires a good understanding of the trade-off involved. In practice, however, in countries in which the governance structure is not reliable or well tested, the rule of thumb to follow is straightforward: keep it simple, fair and transparent to maximize the number of bidders, ensure the success of competition for the market, and minimize the risks of corruption or unfair decisions. (Estache & de Rus, 2000, p23)

Estache and de Rus (2000) provide general bidding process as follows[7].

• Pre-qualification: the government provides information on the state of the assets, the value of the business, and its contractor requirements to identify the potential bidders. This stage also includes criteria for a technical and financial pre-qualification of the bidders. The potential bidders are told the type of sanctions the regulators may impose if they do not deliver once they have won the contract. This pre-qualification is not always necessary, but it is recommended. It minimizes the risks of having incompetent, risk-taking investors trying to get into a business they do not know, or of competent operators trying to commit to financing they cannot deliver.

• Auction: Auction is organized around two criteria consisting of technical and financial field. These can be assessed in three ways as follows: (1) a two-stage selection that first eliminates the weakest technical proposals, then picks the best economic offer among the remaining candidates; (2) a single-stage proposal that ranks the offers according to a weighted average of the technical and financial proposals; and (3) a procedure in which the government specifies the technology and all the engineering aspects desired, and the bidders only compete on the financial dimension.

To actually pick a winner, more specific criteria are needed. This depends on the specific objectives the government is trying to achieve. Table 3 suggests the optimal selection criteria for a spectrum of possible objectives. Table 3 shows that trade-offs do indeed exist. For instance users are not guaranteed to benefit from lower tariffs if the government has fiscal objectives in mind. Indeed, the best way for a government to maximize the willingness of bidders to pay in an auction is to offer a strong monopoly, which implies large potential profits through high tariffs. This strategy makes it particularly difficult for a regulator to ensure efficiency and fairness because the contractor gets contractual protection for the right to use its monopoly powers.

Table 3: Relation between privatization objectives and auction award criteria

Privatization objectives	Auction award criteria						
	Shortest contract duration	Lowest tariff	Minimum subsidy requested	Maximum payment to the government	Maximum number of employees retained	Best investment plan	Minimum net present value of revenue requested
Competition	*	*	*	*			*
Infrastructure quality and capacity						*	
Benefits to the users		*				*	*
Reduction in fiscal deficit			*	*			
Minimal political conflict					*		

* Indicates that the linkage is close

Source: Estache & de Rus, 2000

Based on analysis of road concession programs in Europe, French Highway Directorate (1999) also confirms that there are also differences with respect to concession company selection criteria. In 1999, the main criteria used in Europe were: the amount of the public subsidy required, the credibility of the financial arrangement, the technical quality of the project, operating strategy and price policy, and the reputation of the concession (inclusion of a construction company amongst its

[7] Estache and de Rus, 2000, pp23-24

shareholders, etc.)

Coverage of contract

The concession agreement can be designed in many ways. Indeed, in some countries the government provides many of the details in the information sets provided to the bidders, and in other countries, the government asks the bidders to make many of the suggestions to implement the concession.

Estache, Romero and Strong (2000) provide a minimum list that the overall contract package needs to cover to allow the regulator to referee in cases of conflicts between users and the concessionaire or the government and the concessionaire. The list is as follows: definition of the legal context; administrative background; estimate of the costs of the project; asset valuation rules, economic content of the technical document; various types of guarantees and warrantees; identification of the various types of risks and their distribution between the parties; concession rights and obligations; penalty rules; regulatory regime; information the operator will be required to provide to the regulator; acceptance conditions; limitations on competing facilities; rights to access third-party operated facilities; assignment and termination of the concession; renegotiation rule; and dispute resolution[8].

2-3. Summary

In many countries, transportation infrastructures and services have been managed by the public sector with budgetary fund. But, the public management has resulted in inefficiency, lack of creativity, extraordinary lifecycle costs. In addition, increasing demand of budget toward other sector such as social welfares, make it more difficult to finance the transportation infrastructure with budgetary funding. These problems have encouraged increasing private involvement in the

sector to achieve creativity and efficiency from private entities. Nevertheless, this implies that the government needs to assume new responsibilities to regulate the privatization process, rather than that the government is no longer needed. The worldwide experience of the past decades has demonstrated that the government needs to assume new responsibilities through privatization process.

The various studies as shown in this chapter have identified the need for government regulation in private participation in infrastructure. And the studies argue that the regulation should be enhanced mainly for setting the objectives of privatization clearly, creating competitive environment for the market under monopoly issue, allocating various risks fairly between the parties, selecting regulatory regime to control price and quality and to guarantee reasonable profit to a concessionaire, managing government support and organizing concession contract properly.

[8] For detailed information, see Estache, Romero and Strong, 2000

Chapter 3. Private Participation in Infrastructure in KOREA

Korea has experienced rapid economic growth rate for more than decades. And, with the economic expansion, demand for basic infrastructure services has outstripped the supply capacity of exiting assets, which results in infrastructure deficits. If not eliminated, these deficits could create serious obstacle to further economic growth as well as economic and social inequality leaving certain segments of the population isolated from the benefits of the economic development.

Therefore, since 1994, policy decisions have been taken to introduce private capital in infrastructure with a concession scheme, whereby a private firm would finance, build, operate the infrastructure for maximum 30 years and recover its investment by collecting tariffs from users, to alleviate its budgetary restriction of the government and allow more public resources to be devoted to other social spending.

3-1. Purpose of Adopting Private Participation in Infrastructure

According to the Act on Private Participation in Infrastructure (The act on PPI, 1998), the purpose of adopting private participation in infrastructure in Korea is to encourage the creativity and efficiency in infrastructure facilities through the investment of the private sector.

In the Mid and Long Term SOC[9] Private Fund Investment Plan (2002-2011) made by the government in 2001, the purpose is described in details focused on budget limitation to catch up with future infrastructure demand. Considering increasing budget demands in other sectors-especially in the welfare sector-and future demand of infrastructure itself, the government selects private fund as an alternative to overcome its budget limitation.

[9] SOC stands for Social Overhead Capital. It means main infrastructures such as road, railroad, seaport, airport, and etc in the government budge related documents in Korea.

Then, the government, for the public purpose, could spend some portion of budget saved from private fund investment on developing undeveloped area balancing land development nationwide. The government also expects to adopt "users pay tariff" principle in construction market and increase private sector's role in infrastructure development.

3-2. Legal Frame of Private Participation in Infrastructure

3-2-1. The Act on Private Participation in Infrastructure (The Act on PPI, 1998)

The Korean government has been made various efforts to induce private fund investment in infrastructures since it established the Act on inducement of Private Fund in infrastructure in 1994. And the government amended the Act and renamed it the Act on Private Participation in infrastructure (PPI Act) in 1998, improving its regulatory frame to overcome poor private participation until then.

The Act on Inducement of Private Fund in Infrastructure (1994)

Even though the government continued to invest in infrastructure, the demand, since 1980, has exceeded the supply of infrastructure and following traffic congestion and logistic costs have been main problems for the government to solve. So, the government considered the private participation as an alternative to catch up with the demand with private fund as well as to improve the performance of infrastructures controlled by government and several public agencies with creativity and efficiency from the private sector. Then, in 1991, the government proposed the Special Act on Private Fund Inducement in Infrastructure to the National Assembly to make legal frame for private participation. But, legislators argued that private participation in infrastructure and following concession could be in extreme favor of certain private firms and denied the draft.

However, introducing successful cases about privatization of public agencies and private fund investment in infrastructure and make consensus about positive effects of privatization, the government was successful to make legal environment with establishment of the Act on Inducement of Private Fund in Infrastructure in 1994.

The Act on Private Participation in Infrastructure (1998)

Despite the efforts in the government level, private participation was behind the schedule set by government. Until 1998, 23 projects were announced as Projects for Private Participation in Infrastructure (PPI projects), only 9 projects including the Incheon International Airport Highway found their concessionaires. Furthermore, the Asian financial crisis in 1997 made the private sector dubious about the future of private participation in infrastructure. So, the government recognized the need of new incentive to induce the private fund. With this regard, in 1998, the amended law- The Act on Private Participation in Infrastructure (The Act on PPI) was established with government subsidy such as revenue guarantee of PPI projects. Under this law, the financial support from government was possible up to 90% of expected revenue in the final agreement between the government and the concessionaire to improve profitability of PPI projects and induce private fund. And Private Infrastructure Investment Center of Korea (PICKO) with relevant experts in PPI projects is established to support the government to regulate private participation.

3-2-2. Regulation of Private Investment Project Committee

Based on the Act on PPI, Private Investment Project Committee (the Committee) is in charge of reviewing the following matters:

- Formulation of major policies concerning private sector investment in infrastructure;
- Establishment and modification of the annual plan for private participation in infrastructure;
- Establishment and modification of the instruction for proposal for private participation in

infrastructure;

- Selection of a concessionaire;
- Cancellation of an announcement of solicited projects;
- Other matters which Minister of Planning and Budget proposes for promotion of active private participation in infrastructure projects.

The Committee members are Vice Minister of Planning and Budget (the Chairman), other ten Vice Ministers of Finance and Economy, of Government Administration and Home Affairs, of Culture and Tourism, Agriculture and Forestry, of Industry and Resources, of Information and Communication, of Environment, of Construction and Transportation, of Maritime Affairs and Fisheries, of Science and Technology, and eight or fewer member-commissioned by the Chairman-from the private sector with knowledge and experience in private investment.[10]

If it is deemed that professional or technical advice is necessary for efficiency in the operation of the Committee, the Chairman may establish an advisory sub committee composed of experts in the related fields.

3-2-3. Selection of PPI projects

For solicited projects, the criteria of selection of PPI projects for solicited projects are follows:

- First, the type of projects should be one of the facilities as shown in the Table 5;
- Second, the project should be consistent with mid and long-term investment plan in infrastructure and the national investment priorities of the Government;
- Third, the project should be profitable-based on the result of its feasibility study-to induce private investment.

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[10] Before Mar12, 2003, the members are in the Minister level. Vice Minister of Science and Technology is added in the amended Enforcement Decree

To screen feasibility of large government projects more carefully and independently under the integrated system managed by Ministry of Planning and Budget, preliminary feasibility study is enforced with amendment of Enforcement Decree of the Budget and Accounts Act in 1999. Before introduction of preliminary feasibility study, the budgetary projects had been implemented according to feasibility study managed by competent authority and hence credibility and objectiveness of that feasibility study and fairness of budget allocation had been on debate.

The preliminary study is for large projects above 50 billion Won of total cost, focusing on B/C analysis with supplementary criteria such as compliance to Government mid and long term investment plans and attribution to balanced land development nationwide. This study has been done by Public Investment Management Center (PIMA), established as a public institute in the Korea Development Institute (KDI) in 2000, for expertise in the field and supporting the MPB.

And MPB now is considering other private institute and private firms as well as PIMA for the needed expertise and higher objectiveness. As shown in the Table 4, during 1999-2002, 120 projects planned by various Ministries and local governments are screened by preliminary study and 66 projects have been suspended because of poor feasibility and lower priority (MPB, 2002).

Table 4: Preliminary feasibility study

Billion Won

Year	Projects planned		Projects approved		Projects suspended	
	Number	Project cost estimate	Number	Project cost estimate	Number	Project cost estimate
1999	19	26,663.9	12	6,868.3	7	19,795.6
2000	30	13,888.6	15	6,027.3	15	7,861.3
2001	41	19,765.5	14	6,423.2	27	13,342.3
2002	30	16,583.5	13	6,199.2	17	10,384.3
Sum	120	76,901.5	54	25,518.8	66	51,383.5

Source: MPB, 2002

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of the Act on PPI as of Mar 12, 2003.

In the same context, Private Infrastructure Investment Center of Korea (PICKO) is established in the Korea Research Institute for Human Settlements (KRIHS) for supporting the government in the process of implementing of private participation in infrastructure.

With the criteria and review of the committee, based on relevant preliminary feasibility study, the competent authority decides whether a project is selected as a PPI project. The summarized information is in the Figure 2.

3-2-4. Selection of Concessionaire

Process of selection of concessionaire is summarized in the Figure 3.

Step 1: Formulation and Announcement of the Instruction for Proposal (by competent authority)

The competent authority shall formulate an instruction for proposal for private participation in infrastructure (instruction for proposal). The contents shall be published thereof in the official gazette and at least three daily newspapers. In order for the competent authority to announce the instruction for proposal for projects requiring a total project cost of 200 billion Won or more, the proposal shall be reviewed by the Committee in advance. The competent authority may consult with PICKO for its advisory opinion in the formulation of the instruction for proposal. In particular, the instruction for proposal requiring the deliberation of the Committee shall be reviewed by PICKO prior to such deliberation.

Step 2: Submission of Project Proposal (by Private Sector)

Any party intending to implement a private investment project shall submit a project proposal to the competent authority, in accordance with the laws and regulations concerning the private investment project, the contents of the announced instruction for proposal, etc.

Step 3: Examination and Evaluation of Project Proposal (by Competent Authority & PICKO)

The competent authority designates a potential concessionaire after examining and evaluating the project proposal submitted by the private sector. At least two (2) potential concessionaires shall be selected, except for special circumstances. The competent authority shall establish and operate a team for evaluating project proposals (evaluation team). The Director of PICKO may designate person(s) to participate in the evaluation team.

Criteria for evaluation in the project proposal are as follows:

- Composition of the concessionaire such as the structural make-up of the organization of the concessionaire, the relationship between the project investor and the concessionaire, etc
- Feasibility of the project proposal such as the total project cost, construction period, construction site and content of construction, etc
- Financing plan such as equity and loan arrangement capacity, etc.
- Economic feasibility of the project such as tariff, amount of use, concession period, period of ownership and profit-making operation, rate of return, scale of supplementary projects, if any, etc.
- Land acquisition plan such as the size of land already acquired, the feasibility of the land acquisition plan, etc.
- Technology applied in construction such as the capacity to fulfill the minimum requirement for technology, the applicability of the latest construction technology, etc.
- Facility management capability such as the appropriateness of the maintenance plan, the operation and management plan, etc
- Contribution to the public interest such as the provision of service to the facility user(s), etc
- Other matters which the competent authority deems necessary

The competent authority may adjust the items to be evaluated according to the special characteristics and needs of the project concerned and give proper weight to particular items for the

purpose of evaluation. And the competent authority may set the criteria for pre-qualification (PQ) of the proposers. The technical skills may be evaluated in the first step of the evaluation and specific matters such as financing ability, level of tariff, etc. shall be evaluated second, as deemed necessary by the competent authority.

Step 4: Designation of Concessionaire and Conclusion of Concession Agreement

The competent authority designates a concessionaire by finalizing all negotiations of a concession agreement with the potential concessionaire, which includes terms and conditions of the project implementation.

The competent authority shall consult with PICKO when finalizing the negotiation for the concession agreement on projects requiring a total project cost of 200 billion Won or more. For concession agreement that includes a section promising government support, the competent authority must refer to the opinion of the Minister of Planning and Budget.

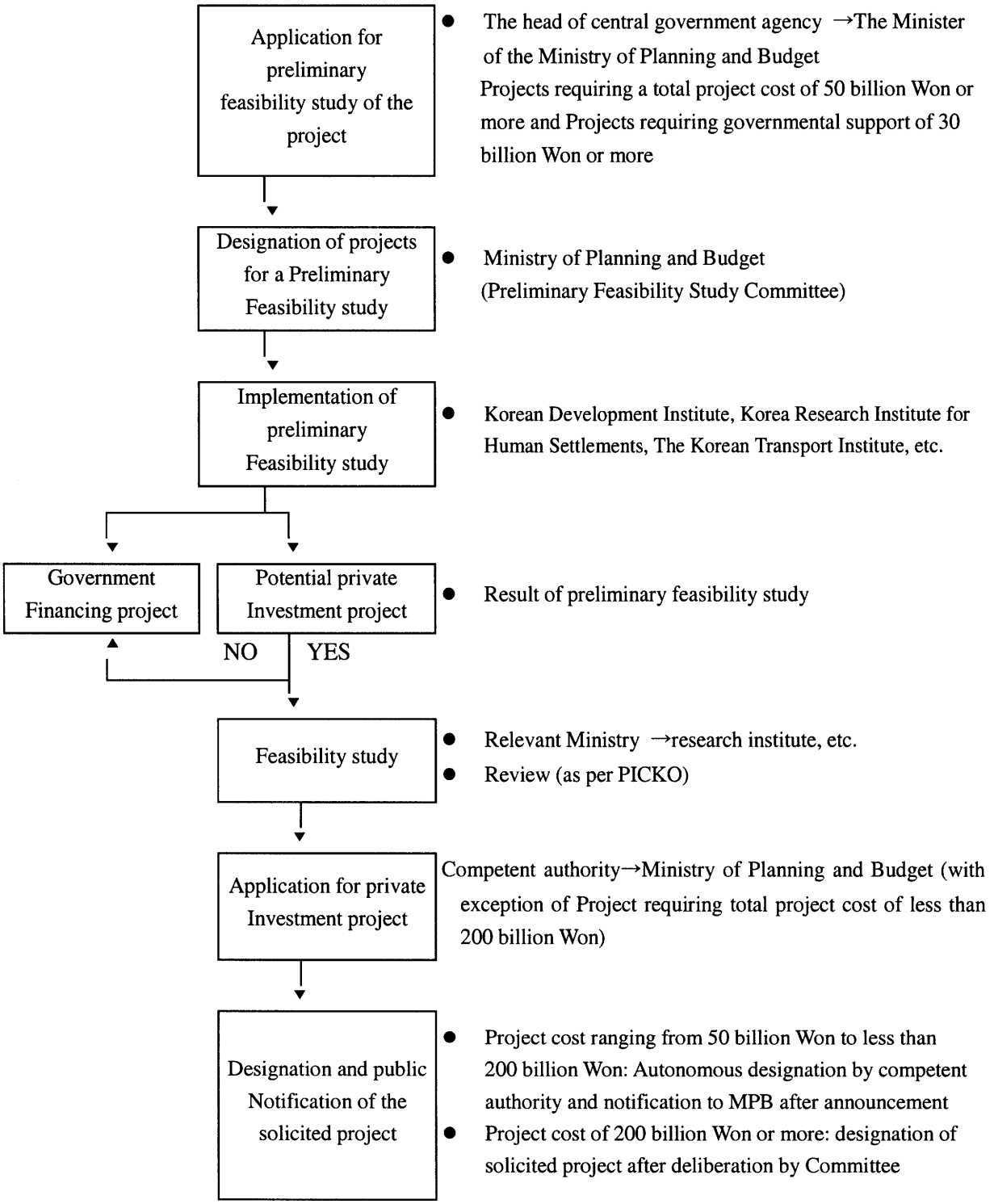
Table 5: Infrastructure Facility Types Defined by The Act on PPI in Korea (34 types)

Sector	Competent Ministry	Infrastructure Facility Types
Road (3)	MOCT	Roads and its ancillary facilities, non-road parking lots, intelligent transportation system
Railways (2)	KNR	Railways
	MOCT	Urban railways
Harbor (3)	MOMAF	Harbor facilities, fishing port facilities, combined passenger facilities
Airport (1)	MOCT	Airport facilities
Water Resources (4)	MOCT	Multi-purpose dams, river-affiliated ancillary structures
	MOE	Sewage, waterworks
Communication (2)	MOIC	Telecommunication facilities, information system
Energy	MOIR	Electric source facilities, gas supply facilities, collective energy facilities
Environment (6)	MOE	Waste disposal facilities, excreta treatment facilities, public treatment facilities of livestock waste water, waste water disposal facilities, recycling facilities, sewage terminal disposal facilities
Distribution (3)	MOCT	Distribution complex, cargo terminals and warehouses, passenger terminals
Culture & Tourism (7)	Ministry of Culture and Tourism	Tourist resorts and resort complex, youth training facilities, public sports facilities, libraries, museums and art galleries, international conference facilities
	MOCT	Urban parks

Note: MOCT: Ministry of Construction and Transportation, KNR: Koran National Railroad, MOE: Ministry of Environment, MOIC: Ministry of Information and Communication, MOIR: Ministry of Industry and Resources.

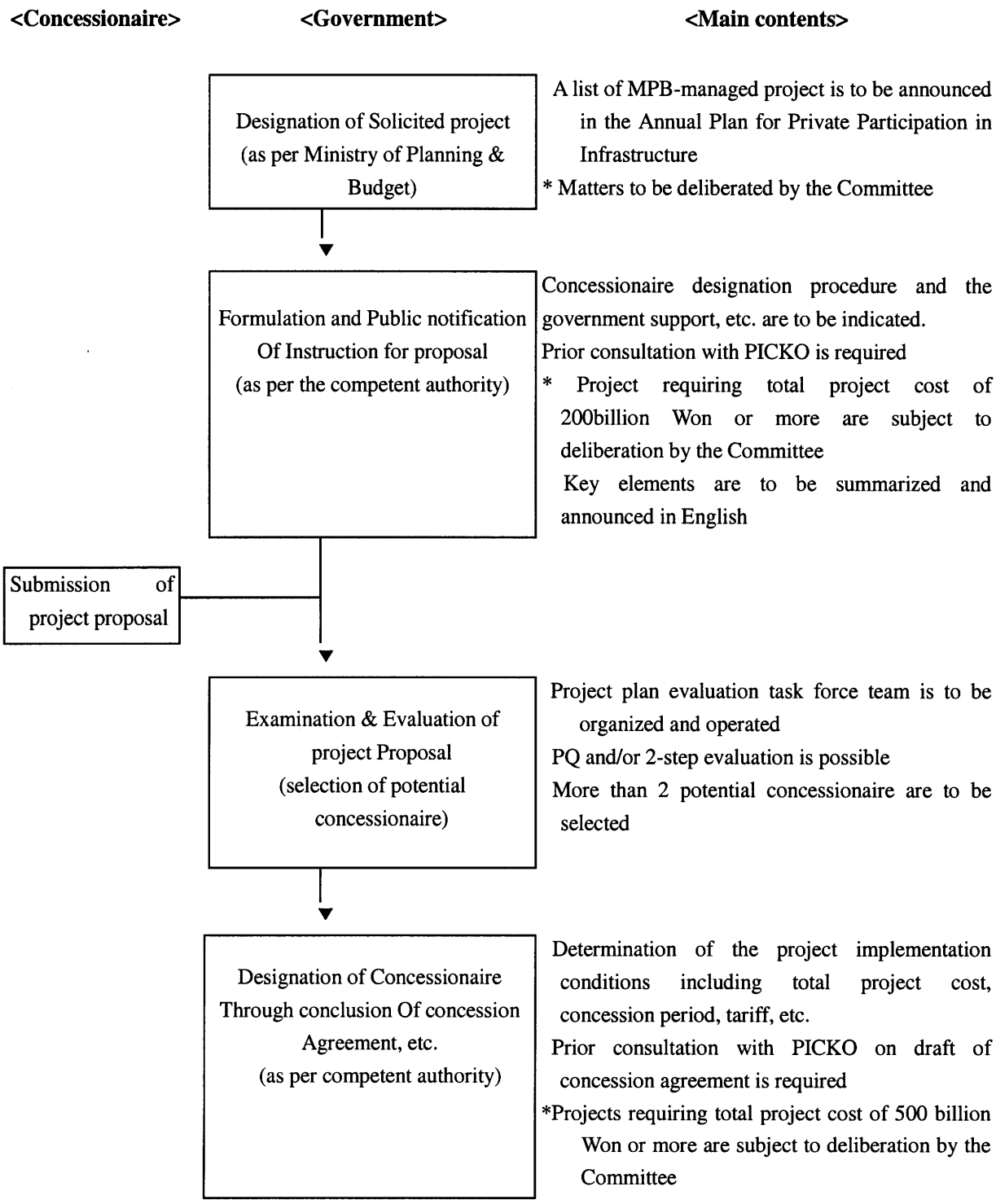
Source: MPB, 2002

Figure 2: Procedure for Selection of PPI Projects (Solicited Project)



Source: MPB, 2000b

Figure 3: Procedure for Selecting a Concessionaire for Solicited PPI Projects



Source: MPB, 2000b

3-3. Status of SOC Investment

The government has tried to increase SOC investment to catch up with its investment schedule for industrial competitiveness in global market since in the late 1990s. The Table 6 shows annual SOC investment in GDP during 1995-2000 and the Table 7 shows annual SOC investment in government budget during 1995-2003. The percentage of SOC investment out of total GDP is 2.4 % in average during that period, and the ratio has been increased after Asian financial crisis in 1997. SOC investment has occupied an average 14.3% of total annual budget during 1995-2003.

Table 6: Annual SOC investment in GDP

Trillion Won

Year	1995	1996	1997	1998	1999	2000
GDP	377.3	418.5	453.3	444.4	482.7	517.1
SOC investment	6.7	8.3	10.3	11.6	13.5	14.2
SOC/GDP	1.78%	1.98%	2.27%	2.61%	2.80%	2.75%

Source: MPB, 2001

Table 7: Annual SOC investment in Government Budget

Trillion Won

Year		1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Budget	Amount	54.8	63.0	71.4	80.8	88.5	94.9	106.1	109.6	111.5
	Increase rate	15.6%	15.0%	13.3%	13.2%	9.5%	7.2%	11.8%	3.29%	1.73%
SOC investment	Amount	6.7	8.3	10.3	11.6	13.5	14.2	15.2	15.98	16.69
	Increase rate	19.6%	23.9%	24.3%	12.6%	16.4%	5.2%	7.0%	5.1%	4.44%
SOC/Total Budget		12.2%	13.2%	14.4%	14.4%	15.3%	15.0%	14.3%	14.6%	15.0%

Source: Lee, 2003 & MPB, 2001

3-4. Actual implementation of PPI projects

Since 1995, the total 128 projects with total cost of 40.6 trillion Won have been announced as PPI projects. Among them, 83 projects (65%) have found private participants: 27 projects (21%) are under operation; 33 projects (26%) are under construction; and 23 projects (18%) are under final agreements. Since then, the actual private fund investment has increased to occupy 9.6 % of total infrastructure investment of 17.7 trillion Won (budgetary fund: 16, private fund: 1.7) in 2002.

3-4-1 Definitions

Based on "The Private Participation in Infrastructure Annual Plan for the Year 2002, 2002" Private Participation in Infrastructure (PPI) can be categorized as follows:

• *MPB-managed Projects:* if the total cost of the project is over 200 billion Korean Won the project is managed by Ministry of Planning and Budget (MPB) and included in the Private Participation in Infrastructure Annual Plan based on the Act on PPI.

• *Non MPB-managed Projects:* compared to MPB-managed projects, if the total cost of the project is under 200 billion Korean Won the project is managed by other competent central government (for example, Ministry of Construction and Transportation, Ministry of Maritime Affairs and Fisheries) or competent local government.

• *Solicited Projects:* these projects are planned by the central or local governments and implemented by MPB-managed projects or Non MPB-managed projects according to their total costs.

• *Unsolicited Projects:* unlike solicited projects, unsolicited projects are proposed by private sector. Then, after review defined in the Act on PPI and other procedure, it can be selected and

implemented as PPI projects.

3-4-2 Aggregated Data of implementation of PPI projects

Since 1994, 128 projects have been announced as PPI projects. Ministry of Planning and Budget have managed 37 projects, and other authorities have controlled residual 91 projects as shown in the table 8. Among 128 projects 94 projects have planned by the government as solicited projects, and residual 34 projects have been proposed by private sector as unsolicited projects.

Table 8: The number of projects announced as PPI project in Korea

	MPB-managed Projects			Non MPB-managed Projects		
Total	Sub sum	Solicited	Unsolicited	Sub sum	Solicited	Unsolicited
128	37	30	7	91	64	27

Source: Adopted from MPB, 2002 & Huh, 2003

Among the 128 projects announced as PPI projects. Among them, 83 projects (65%) have found private participants: 27 projects (21%) are under operation; 33 projects (26%) are under construction; and 23 projects (18%) are under final agreements. The Table 9 shows the implementation status of the projects.

Table 9: The implementation status of 128 PPI projects

Implementation Status	Sum	Operation	Construction	Final Agreement	Others
The number of Projects	128	27	33	23	45
Percentage	100	21%	26%	18%	35%

Table 10 shows the type and cost of PPI projects. Their total project cost is 40.6 trillion Won including government subsidy. Among them, roads and tunnels occupies the largest portion (48%,

19.4 trillion Won) in terms of project cost. Environmental facilities have the largest number of projects (33 projects, 26%), but their portion in the total project cost is just below 5%.

Table 10: Type and cost of projects announced as PPI project in Korea

Trillion Won

Type	Airport Seaport	Railroad	Road Tunnel	Parking Lot	Environ ment	Tourism	Others	Total
Number of Projects	15	7	31	23	33	9	10	128
Cost of Projects	4.5	9.4	19.4	0.2	1.9	1.7	3.5	40.6

Source: MPB, 2003

Table 11 shows actual private fund investment in PPI projects. In 1995, private fund was just 0.1% of government fund invested in SOC. But, private fund investment portion continues to increase up to 10.6% in 2002.

Table 11: Actual Private investment in the SOC Investment in Korea

Trillion Won

Year	1995	1996	1997	1998	1999	2000	2001	2002
Government Fund	6.7	8.3	10.3	11.7	13.5	14.2	15.2	16.0
Private Fund	0.01	0.05	0.3	0.5	0.8	1	0.6	1.7
Private/Government	0.1%	0.6%	2.9%	4.3%	5.9%	7%	3.9%	10.6%

Source: Adopted from MPB, 2003

3-4-3 MPB-managed PPI projects

Since 10 projects over individual projects cost of 200 billion Won were announced as PPI projects total 37 MPB managed projects have been selected as PPI projects as shown in the Table 12. In the

beginning period, the announcement was relatively active, but recent status is not as active as the past.

Table 12: The number of projects selected as MPB-managed project in Korea (1995-2002)

Total	1995	1996	1997	1998	1999	2000	2001	2002
37	10	6	6	1	6	2	4	2

Source: Adopted from MPB, 2002

Table 13 shows the detailed list of 37 projects. As shown in the Table 13, among 37 projects, 4 projects including Incheon International Airport Highway are under operation, 6 projects are under construction, 5 projects are about to be constructed after finalizing concession agreement, 20 projects are under negotiation between the government and the possible concessionaire, and 2 projects just made the RFP in public. Among these 37 large projects, 7 projects have been proposed by the private sector and this expansion of unsolicited projects has been conspicuous since 2000.

Even though expansion of private participation in large projects, higher construction costs compared with budgetary funding projects and users' complaints against higher tariff has been recognized. Hah and Moh also argue that the construction costs of winning bidders are about 83% of estimate reference prepared by the government in the budgetary funding projects, but in case of PPI projects, they are around 90% and relatively higher. And the toll rates of these projects are 2-2.5 times higher than the rate (38.1Won/km) of other toll roads managed by the public agency, which leads to complaints of users as well as residents along the road. Hah and Moh also argue that concession authority has experienced head to head competition from bidders in only 3 projects out of 37 MPB-managed projects: Incheon Int'l Airport Cargo Terminal; Pusan-Kimhae Light Rail Transit; Uijongbu Light Rail Transit (Hah and Moh, 2003).

Table 13: MPB-Managed Private Participation Projects in Korea (37 projects)

Status	Competent Authority	Project
Operation (4 Projects)	MOCT (3)	Incheon Int'l Airport Expressway, Incheon Int'l Airport Cargo Terminal, Cheonan—Nonsan Expressway
	Kwangju Metro City (1)	Kwangju Second Ring Road 1st Sector
Construction (6 Projects)	MOCT (2)	Taegu—Pusan Expressway Seoul Beltway (Ilsan—Taegaewon)
	MOMAF (2)	Pusan New Port, Mokpo Outer Port—Phase I
	Seoul Metro City (1)	Seoul Mt. Umyeon Tunnel
	KNR (1)	Incheon Int'l Airport Railroad
Final agreement (5 Projects)	MOCT (2)	Honam Cargo Terminal, Kyungin Canal
	MOMAF (1)	Incheon North Harbor
	Seoul Metro City (1)	Seoul Gangnam Circulatory Urban Expressway*
	Kyunggi Province (1)	Ilsan Grand Bridge
Negotiation for final agreement (20 Projcets)	MOCT (5)	Seoul—Hanam Light Rail Transit(LRT) Pusan—Kimhae LRT, The 2nd Younyuk Bridge* Seoul—Chunchon Expressway* Seosuwon-Osan-Pyungtaek Expressway*
	Pusan Metro City (3)	Pusan—Geoje Link, Pusan Choub LRT, Pusan Coastal Ring Road (North Harbor Bridge)
	Kyunggi Province (1)	Namdong, Inchon—Dori, Siheung IC
	Pucheon City (1)	Kyungin Bypass Roads
	Kyungnam Province(1)	Machang Grand Bridge
	Incheon (1)	Yongyu-Muwi Tourist Complex*
	MOMAF (3)	Masan Port -Phase I, Pohang-Youngil Port, Ulsan New Port Project—Phase I
	Seoul Metro City (1)	Seoul Urban Railway No9— Phase I
	Jeonbuk Province (1)	Jeonbuk sewage facility*
	Kimpo City (1)	Gochon—Wolghot Road
	Uijongbu City (1)	Uijongbu LRT
	Yongin City (1)	Yongin LRT
Notification for RFP (2 Projects)	MOCT (2)	Central Area Compound Cargo Terminal Youngnam Area Compound Cargo Terminal
Total (37 projects)	MOCT: 14, MOMAF: 6, KNR: 1, and 11 Local Governments: 16	

Note: MOCT: Ministry of Construction and Transportation, MOMAF: Ministry of Maritime Affairs and Fisheries, KNR: Korean National Railroad, * Indicates unsolicited projects.

Source: MPB, 2002

And actual traffic of most toll road under are operation under 65% of expected demand in final concession agreements, even though the operation is just in the beginning stage and one can rule out possibility of increasing traffic in the future (Huh, 2003). For instance, Cheonan-Nonsan Expressway under operation has experienced only below 40 % of expected demand. This could lead to unexpected budgetary burden due to government's compensation up to 90% of expected revenue based on the concession agreement. (Chosun, 2003) This optimistic demand forecasting trend will be discussed in details with demand forecast risk allocation and negative impacts of government income guarantee in Chapter 3.

Financial source of MPB managed projects is described in the Table 14. About 74.5 percent of the project costs is supported by private sector. And 25.5 percent is from government subsidy.

In total private funds excluding government subsidy, equity portion is about 28%, because the government requires investors provide minimum 25% of private fund as equity investment. With this regard, arguing that the regulation could be a burden for investors and a obstacle to active participation of private entities sector, Lee suggest that subordinated loans can be included in the minimum 25% equity portion to alleviate the burden (Lee, 2003)

Table 14: Financial Source of Selected MPB-Managed PPI Projects in Korea*

Financial Source	Sum	Government (Subsidy)	Investors (Equity)	Lenders (Debt)	Others
Amount (Trillion Won)	34.4381	8.7940	7.1859	17.9721	0.4861
Percentage (%)	100	25.5	20.9	52.2	1.4

*This comes from 35 projects excluding 2 projects under notification of RFP from 37 projects
Source: Lee, 2003

Table 15 shows investor breakdown of selected 15 MPB projects. Domestic construction companies occupy 86% of investors investing 3.95 trillion Won out of total equity, 4.59 trillion Won. They are most active in the PPI projects as investors as well as construction contractors in the PPI projects.

But, on the other hand, the Table 15 also shows lack of diversity of financial source. Furthermore, construction companies have difficulties financing large and long term investment in itself, and hence have to focus on short term recovery from profit of construction itself rather than creating efficiency and creativeness through lifecycle of a infrastructure (Lee, 2003). One of the main reasons that a lot of projects have been successful finding a concessionaire is that some construction companies, with expectation of government guarantee not to abandon the projects, want to keep them rolling adding amount of their projects awarded by the government (PIMA, 2000). This problem also will be discussed in the context of strategic optimism in private firms in Chapter 4.

Table 15: Investor Breakdown of Selected MPB-Managed PPI Projects in Korea*

Investor	Sum (Equity)	Construction Companies	Insurance Companies	Others	Public
Amount (Trillion Won)	4.5858	3.9501	0.1300	0.2300	0.2726
Percentage (%)	100	86.1	2.8	5.1	6.0

*This comes from 15 projects under operation, construction, or reaching final agreement, excluding 20 projects under negotiation or notification of RFP in the previous table

Source: Lee, 2003

The composition of lenders is shown in the Table 16. Domestic Banks are most active lenders in PPI projects and support 68.6 % of total debt. In the second place, domestic insurance companies occupy 13.1%. Foreign fund occupies just 6.5% of total debt amount of selected 21 PPI projects.

The table shows clearly dominance of domestic fund. Lee argue that country risk, in the context of privatization in Korea, is recognized higher by foreign investors and lenders than expected by the government, mainly due to exchange rate risk, and the foreign fund seems not competitive in domestic market (Lee, 2003)

Table 16: Lender Breakdown of Selected PPI Projects in Korea*

Trillion Won

Lender		Type			Percentage
		Loan	Bond	Sum	
Domestic Fund	Bank	2.2740	1.8690	4.1430	68.6%
	Life Insurance Company	0.5581	0.1300	0.6881	11.4%
	Damage Insurance Company	0.0730	0.0300	0.1030	1.7%
	Government	0.0151	0.1000	0.0151	1.9%
	Others	0.1486	0.1500	0.2986	4.9%
	National Pension Fund	-	0.3000	0.3000	5.0%
Foreign Fund		0.2600	0.1300	0.3900	6.5%
Sum		3.3288	2.7090	6.0378	100%

* This comes from selected 21 projects from MPB managed PPI projects as well as Non-MPB managed Projects as of Dec., 2002

Source: Lee, 2003 & PICKO, 2002

3-4-4. Non MPB-managed PPI projects

As shown in the Table 17, the total number of Non MPB-managed PPI projects is 91. Among 91 projects, 23 projects are under operation, 27 projects are under construction, 18 projects are about to be constructed after finalizing concession agreement, 18 projects are under negotiation between the government and the possible concessionaire, 3 projects made the RFP in public, and 2 projects are under review.

Environmental facilities, with 32 projects, occupy 35% of these smaller projects below total project cost of 200 billion Won. And active parking lot development with 23 projects is also unique part of this area. Transportation sector has 23 projects. Transportation facilities and services are active in both larger MPB-managed projects and smaller Non MPB-managed projects.

Table 17: Non MPB-Managed Private Participation Projects in Korea (91 Projects)

Implementation Status	Total	Transportation	Parking Lot	Tourism	Environmental Facilities
Operation	23 projects	10	8	3	2
Construction	27 projects	8	5	6	8
Final Agreement	18 projects	-	9	2	7
Negotiation for agreement	18 projects	5	1	2	10
Notification for RFP	3 projects	-	-	-	3
Under Scrutiny	2 projects	-	-	-	2
Total	91 projects	23 projects Road: 6 Tunnel: 8 Seaport: 3 Airport: 6	23 projects	13 projects Tourism Complex Development: 8 Others: 5	32 projects Sewage: 24 Incinerator: 3 Recycling: 3 Others: 2
	Solicited: 64 Unsolicited: 27	Solicited: 16 Unsolicited: 7	Solicited: 19 Unsolicited: 4	Solicited: 11 Unsolicited: 2	Solicited: 18 Unsolicited: 14

Source: Huh, 2003 & PICKO, 2002

Table 18 shows financial source of the 91 Non MPB-managed PPI projects. Like MPB-managed projects, 76 percent of total project cost comes from private fund. The residual 24 % is expected to be supported by Central and local government.

Table 18: Financial Source of Non MPB-Managed PPI Projects in Korea (91 Projects)

Source	Sum	Central Government Fund	Local Government Fund	Private Fund	Others
Amount (Trillion Won)	5.5839	0.8194	5,243	4.2386	0.0016
Percentage (%)	100	14.7	9.4	75.9	-

Source: Lee, 2003 & PICKO, 2002

3-5. Long Term Plan for Private Participation in Infrastructure

The government made several long term investment plan in infrastructure during 2000-2020 to catch up with the increasing demand in the sector, and, based on them, made a updated mid-long term private fund investment plan during 2002-2011.

The plan requires 198.9 trillion Won among which the government expects to provide 159.2-180.4 trillion Won from its budget and the rest 18.5-39.7 trillion Won from private fund. With this regard, the government also made the list of future PPI projects as a reference to manage the future PPI projects, which consist of 179 projects with total cost estimate of 63 trillion Won as will be explained in this chapter.

3-5-1 Future Demand of Infrastructure Investment

The government made several mid and long-term investment plans in infrastructure during 2000-2020 to catch up with the increasing demand. According to the three government plans, future SOC demand is shown as follows:

- *The 1st Mid-term Transportation Investment Plan (2000-2004):* During 2000-2004, total 100 trillion Won (road 54.7%, railroad 28.7%, Airport 4.6%, Seaport 9.9%, Logistics and others 2.1%) is required to construct transportation facilities;

- *The National Transportation Network Plan (2000-2019):* During 2000-2019, total 335 trillion Won (road 55.5%, railroad 28.1%, Airport 4.2%, Seaport 11%, Logistics 1.2%) is required in SOC sector;

- *The 4th Land Development Plan (2001-2020):* During 2000-2019, total 343 trillion Won (road 57.1%, railroad 21.3%, Airport 4.5%, Seaport 11.1%, Logistics 6%) is required in SOC sector;

And this information is summarized in the Table 19.

Table 19: SOC Investment Demand in the Three Government Plans

Sector	The 1st Mid-term Transportation Investment Plan (2000-2004)	The National Transportation Network Plan (2000-2019)	The 4th National Land Development Plan (2001-2020)
Road	54.7	186.3	196.4
Railroad	28.6	94.0	72.9
Airport	4.6	13.7	15.6
Seaport	9.9	36.8	38.3
Logistics	2.1	3.9	20.0
Sum	100	335	343

Source: Adopted from MPB,2001

Then, during 2002-2001, SOC investment demand is calculated mainly based on the the 1st Mid-term Transportation Investment Plan (2000-2004) and other two plans. During 2002-2011, total 198.9 trillion Won is required and Table 20 shows the details.

Table 20: SOC Investment Demand (2002-2011)

Sector	Investment Demand (Trillion Won)	Percentage (%)
Road	109.3	54.9
Railroad	57.2	28.8
Airport	6.6	3.3
Seaport	22.5	11.3
Logistics	3.3	1.7
Sum	198.9	100

Source: MPB, 2001

3-5-2. Forecasting of Private Fund Demand for Infrastructure Investment Demand

According to the three government plans, the available government fund is forecasted from 12.5 trillion Won to 16.0 trillion Won annually as shown in the table 21.

Table 21: Forecasting of Available Government Fund for SOC Investment

Trillion Won

Sector	The 1st Mid-term Transportation Investment Plan (2000-2004)	The National Transportation Network Plan (2000-2019)	The 4th National Land Development Plan (2001-2020)
Demand	100	335	343
Supply From Government	69.9 (14.0/year)	250 (12.5/year)	320 (16.0/year)

Source: Adopted from MPB, 2001

Referring to the above results and adding some assumptions[11], the government expects to provide 159.2(16/year)-180.4(18/year) trillion Won for SOC investment during 2002-2011. Therefore, it is forecasted that 18.5-39.7 trillion Won should be provided from private sector through PPI projects. This result is detailed in the Table 22.

3-5-3 Potential PPI projects during 2002-2011

To manage the future PPI projects systematically, the government selected 179 projects as Potential PPI projects as a reference in the Mid and Long Term SOC Private Fund Investment Plan during 2002-2011 (MPB, 2001). They could be announced as actual PPI projects and implemented through private participation if they are proved to be appropriate as detailed feasibility study later and succeed to find a concessionaire.

[11] For this calculation, annual GDP increase rate is assumed as 4-6% and SOC/GDP is assumed as 2.4% based on the Table 6.

Table 22: Expectation of Financial Source of SOC Investment Demand

Trillion Won

Sector	Investment Demand	Available Government Fund (A)	PPI Projects			Government Funded Project (A-C)
			Private fund (B)	Government Subsidy (C)	Sum (B+C)	
Road	109.3	85.8-97.5	11.8-23.5	5.1-10.1	16.9-33.6	75.7-92.4
Railroad	57.2	46.3-52.6	4.6-10.9	3.1-7.3	7.7-18.2	39.0-49.5
Airport	6.6	6.2-6.6	0-0.4	0-0.2	0-0.6	6.0-6.6
Seaport	22.5	18.2-20.6	1.9-4.3	1.3-2.9	3.2-7.2	15.3-19.3
Logistics	3.3	2.7-3.1	0.2-0.6	0.1-0.1	0.3-0.7	2.6-3.0
Sum	198.9	159.2-180.4	18.5-39.7	9.6-20.6	28.1-60.3	138.6-170.8

Note: Total available government fund is allocated to each sector as follows: road 53.9%, railroad 29.1%, airport 3.9%, seaport 11.4%, and logistics 1.7% based on analysis about future trend of each sector.

Source: MPB, 2001

The projects are selected based on different criteria according to facility type-such as road, railroad, airport, seaport, logistics, environmental facilities, energy facilities, and tourism facilities. But in general, relevance to government long-term master plan, brief B/C analysis, profitability, size and etc are considered.

Total cost estimate of the 179 projects is 63.2 trillion Won. With regard to financial source, 46.7 trillion Won is expected to be from private sector and residual 16.4 trillion Won is supposed to be funded by government subsidy.

Among 179 projects, transportation sector- such as road, railroad, airport, seaport and etc-occupies 72 projects (40 trillion Won), other sector-such as environmental facilities, energy facilities and etc-has 107 projects (23.2 trillion Won). These projects are summarized in the Table 23[12].

[12] For more detailed information such as individual project profile and criteria for selection and etc, see "the Mid and Long Term SOC Private Fund Investment Plan during 2002-2011 (MPB, 2001)" in Korean

Table 23: Summary of Potential PPI Projects and Financial Source

Item			Potential Project		Government Subsidy Estimate	Private Fund Estimate
			Number	Cost Estimate		
Transportation	Road	Highway	10	11,526.6	3,458.0	8,068.6
		Local road with government support	4	1,619.4	485.8	1,133.6
		Local road	4	5,727.9	1,718.4	4,009.5
		Sub sum	18	18,873.9	5,662.2	13,211.7
	Railroad	National network	5	5,200.1	2,080.0	3,120.1
		Urban railroad	3	1,329.6	531.9	797.7
		Light Rail Transit	15	6,774.5	2,709.8	4,064.7
		Sub sum	23	13,304.2	5,321.7	7,982.5
	Seaport	Trade Harbor	23	6,001.2	2,400.5	3,600.7
		Fishery Harbor	2	140.4	56.1	84.3
		Park etc	3	837.9	335.2	502.7
		Passenger facility	1	22.3	8.9	13.4
		Sub Sum	29	7,001.8	2,800.7	4201.1
	Logistics		2	867.9	173.9	695.8
	Sum		72	40,049.6	13,958.5	26,091.1
Others	Environmental facilities		89	3,942.5	1,769.3	2,173.2
	Energy facilities		13	14,419.3	-	14,419.3
	Tourism facilities		5	4,764.7	714.7	4,050.0
	Sum		107	23,126.5	2,484.0	20,642.5
Total			179	63,176.1	16,442.5	46,733.6

Source: MPB, 2001

3-6. Summary

Korea has experienced rapid economic growth rate for more than decades. And, with the economic expansion, demand for basic infrastructure services has outstripped the supply capacity of exiting assets, which results in infrastructure deficits. If not eliminated, these deficits could create serious obstacle to further economic growth as well as economic and social inequality leaving certain segments of the population isolated from the benefits of the economic development. Therefore, since 1994, policy decisions have been taken to introduce private capital in infrastructure with a concession scheme, whereby a private firm would finance, build, operate the infrastructure for maximum 30 years and recover its investment by collecting tariffs from users, to alleviate its budgetary restriction of the government and allow more public resources to be devoted to other social spending.

With this regard, the government made several long-term investment plan in infrastructure during 2000-2020 to catch up with the increasing demand in the sector, and, based on them, made a updated mid-long term private fund investment plan during 2002-2011. The plan requires 198.9 trillion Won among which the government expects to provide 159.2-180.4 trillion Won from its budget and the rest 18.5-39.7 trillion Won from private fund.

Since 1995, the total 128 projects with total cost of 40.6 trillion Won have been announced as PPI projects. Among them, 83 projects (65%) have found private participants: 27 projects (21%) are under operation; 33 projects (26%) are under construction; and 23 projects (18%) are under final agreements. Since then, the actual private fund investment has increased to occupy 9.6 % of total infrastructure investment of 17.7 trillion Won (budgetary fund: 16, private fund: 1.7) in 2002. And the government also made the list of future PPI projects as a reference to manage the future PPI projects, which consist of 179 projects with total cost estimate of 63 trillion Won.

On one hand, such quantitative expansion of private fund investment has been appraised in terms of

attenuating budgetary limitation and following allowance of investment in other social sectors, and on the other hand, qualitative results of PPI projects have been on debate such as lack of diversity of financial source, higher construction costs compared with budgetary funding projects and users' complaints against higher tariff, lack of competition, tedious and lengthy process of negotiation and screening of average 3-4 years from announcement of a concession project to approval of implementation plan of a concessionaire, too generous revenue guarantee and following budgetary burden, and optimistic demand forecasts.

One of the main problems is that government guarantee up to 90% of expected revenue. Even though the Act on PPI and its Enforcement Decree provide a legal ground that the concession authority could guarantee, in maximum, 90 % of expected revenue for a concessionaire and the certain amount of guarantee should be decided through negotiation, actual concession agreement have maximum guarantee range of 90%. And this mechanism is criticized as a systemic regime to reduce incentive of private participants to screen the feasibility of projects and result in optimistic demand forecasts. This issue will be discussed in details in Chapter 4.

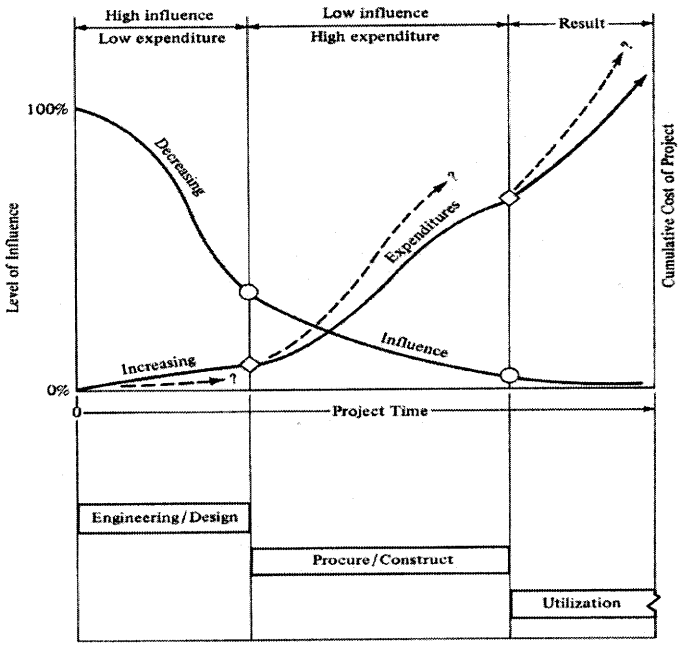
Chapter 4. Demand forecasting and risk allocation in transportation infrastructures

4-1. Level of influence of decision making based on demand forecasts

When the policy makers decide whether to get a transportation project started, based on a feasibility study, one of the main factors is future demand forecast in such transportation infrastructure. When the forecast is poorly estimated, it can lead to a considerable misuse of resources otherwise can support other feasible projects. However in real world, this is the case with biased overestimation of future demand from strategic optimism in the public and private sector, which will be discussed in this chapter.

Before the detailed discussion, Figure 4 shows the importance of initial review of project feasibility including demand forecasting and following decision to go ahead with certain projects.

Figure 4: Level of influence on project costs



Source: Paulson (1976)

Figure 4 illustrates essential features of the level-of-influence concept. The lower portion simplifies the life of a project in three phases: (1) feasibility studies, engineering and design, (2) construction, and (3) operation. The upper portion consists of two main curves. The curve descending from the left-hand with project time shows the decreasing level of influence. And the curve ascending toward right-hand is accumulative expenditure.

In early stage of feasibility studies,

preliminary design, and even detail design, the relative expenditures are small compared with those of the project as a whole; typically, engineering and design fees amount to well under 10 percent of total construction costs. However, despite the smaller expenditure, decisions and commitments made during that period have far greater influence. The first decision is to build or not to build. Then, other decisions such as-two lanes or fore lanes?, toll funding or budgetary funding?, and etc.- follow. In earlier stage than this, the policy makers could face to select one project rather than other projects based on their priority comparison due to limited government budget. As these decisions evolved and commitments made, the remaining level of influence on what the project costs will ultimately become drops precipitously. (Paulson, 1976 and 1992)

4-2. Overoptimistic demand forecasting

4-2-1. Overoptimistic demand forecasting in real world

Frequent failures of demand forecasting are fairly biased toward overestimation. Skamris and Flyvberg (1997) provide useful documents about overoptimistic forecasts as well as cost overruns in large transport infrastructure projects in the UK, US, Sweden, Denmark and as well as developing countries as summarized in the Table 24, Table 25, and Table 26. From the projects examined, they conclude as follows:[13]

Cost overruns of 50-100% are common for large transport infrastructure projects and overruns above 100% are not common. Traffic forecasts that are out by 20-60% compared with actual development are common for these projects. Forecasts of project viability for large transport infrastructure projects are often over-optimistic to a degree where such forecasts correspond poorly with actual development (Skamris and Flyvberg, 1997, p 145).

Table 24: Percentage distribution of cost development in 41 transport infrastructure projects in

Denmark, Sweden, UK, and US.

Percentage of difference (%)	-15 to +10	+10 to +20	+20 to +50	+50 to +100	+100 to +500
Percentage of projects (%)	24	5	24	32	15

Note: Percentage of difference is calculated by (Actual-Forecast)/Actual×100

Source: Adopted from Skamris and Flyvberg, 1997

Table 25: Percentage distribution of traffic development in 20 transport infrastructure projects in Denmark, Sweden, and US.

Percentage of difference (%)	-90 to -70	-70 to -60	-60 to -50	-50 to -20	-20 to 0	0 to +30
Percentage of projects (%)	15	20	25	25	10	5

Note: Percentage of difference is calculated by (Actual-Forecast)/Actual×100

Source: Adopted from Skamris and Flyvberg, 1997

Table 26: Difference between actual development and forecasts of construction costs and traffic for metro systems in developing countries

Difference between actual development and forecasts			
Construction cost	Number of projects	Traffic	Number of projects
-10% to +10%	3	As forecast	1
+10% to +20%	1	0 to –20%	1
+20% to +50%	3	-20% to –50%	2
+50% to +100%	4	-50% to –60%	2
+100% to + 500%	2	-60% to –70%	2

Source: Adopted from Skamris and Flyvberg, 1997

[13] For more detailed information about the documents, see Skamris and Flyvberg, 1997

And according to Trujillo and others (2001), there is enough experience to be able to argue that overoptimistic demand forecasting is common. For instance, traffic forecast for some of the most publicized toll roads projects overshot actual traffic from 25% (Cuernavaca-Acapulco in Mexico) to as much as 60% (M1-M15 Highway in Hungary or the average for the Mexican toll road program). Most of Asia's BOTs projects for toll roads were based on very optimistic growth assumptions pre-dating the fallout at the end of the 1990s (Trujillo et al, 2001, p6)

4-2-2. Characteristics of demand forecasting

Basically, demand forecasting is challenging part with a lot of complex factors to be considered technically and economically. Engel and others point out challenging macro and micro risks in demand forecasting as follows:

Demand forecasts are based on estimates of both macroeconomic risks, which are tied to the aggregate performance of the economy, and microeconomic risks, which reflect local demand fluctuations. Errors in either estimate will throw off forecasts of demand, which are usually inaccurate in the short term (three to five years) an all but useless in the long term (Engel et al, 1997, p 95).

And they provide practical data showing the characteristics of passenger demand in the Table 27. The table shows the rates of growth of vehicles paying tolls during 1986-1994 when Chile was most stable without any recessions. Macroeconomic trend is recognized in the positive growth rates all through the period and specifically faster growth rates in 1987 on all the three roads. Microeconomic trend is reflected in the incoherent fluctuation from one road to another in most years. (Engel et al, 1997)

Table 27: Growth rate of vehicles paying tolls on three main toll roads in Chile

Toll Road	1986	1987	1988	1989	1990	1991	1992	1993	1994
Angostura	8.8	15.0	11.7	4.5	8.7	12.4	6.7	7.8	9.4
Zapata	21.5	14.4	13.1	8.1	7.2	5.2	2.9	3.9	4.9
Lampa	3.8	13.4	15.9	8.9	6.8	18.0	8.8	16.2	12.5

Source: Engel et al, 1997

And, in the context of privatization, Trujillo and others argue that forecasting of users' willingness to pay roads in privatized projects and their behavior of pursuing an alternative such as free roads is an important part but often is managed poorly and ignored by government and regulators. This often can lead to significant overestimates when there is no or little experience of payment of fair prices, the introduction of efficient pricing policies based on project costs can result in significant trend changes and the past is a poor indicator of the future. And they provide technical improvement about analytical instruments and the data processing capabilities enough to argue that some forecasting firms are willing to sell their forecast with insurance in case of significant gaps between forecasts and occurrences[14]. With this regard, they emphasize that more investment is needed on demand forecasting pointing out that both regulators and concessionaire or bidders devote much more money to the construction costs studies than to the demand analysis-the average ratio quoted among experts is one (Trujillo et al, 2000).

French Highway Directorate, with comprehensive study of road concession programs in Europe, also argues that the increasing degree of interrelationship between motorway sections under concession within the same network is making it more and more difficult for the concession companies alone to carry the commercial risk, since traffic levels can vary considerably according to commercial policies that are defined on an individual basis. And long concession period also makes it difficult to bear commercial risks due to high uncertainty (French Highway Directorate, 1999)

[14] For more detailed information such as technical improvement of demand forecasting in actual cases, see Trujillo et al, 2000

However, interestingly and reasonably, Wachs (1990), arguing that public resource allocation is competitive process selecting some projects among a lot of projects proposed, imply that these complexity of demand forecasting is a ground of political misuse to get the projects started rather than a reason of demand forecasting failures and show such characteristics of demand forecasting as follows[15]:

• Forecasts cannot be verified until the intended action is actually taken;

• Forecasts are technically complex: elaborate data bases and complex mathematical models are used to make forecasts of the demand for and the cost of large public works. The technical reports in which the forecasts are presented are weighty, written in technical jargon, and replete with mathematical equations and tables of computer printouts. Consequently, very few people other than those who prepare them can every fully review and critique them. In short, it is often very difficult to prove that forecasts were adjusted for political reasons.;

• Forecasts always require subjective assumptions: the technical complexity of forecasts is in fact quite misleading. While equations, computers, and enormous data bases give the forecasts an aura of "science," which invests them with certain authority in the political arena, the most critical data needed to make a forecast often consists of assumptions about the future. The complex mathematical models and large data bases characteristic of modern forecasts thus obfuscate the fact that they are all elaborations of relatively simple assumptions about the future, and they hide from the public the fact that the assumptions included in the forecast can be selected to help advocate certain courses of action for political purposes; and

• Forecasts are the product of "Many Hands," and moral responsibility is hard to fix: Because forecasts are prepared by large organizations, such as consulting firms which are in turn employed by government departments, and because complex computer models and data bases are managed by

[15] Wachs, 1990 pp146-152

teams, it is invariably difficult to identify one person or small group of people who can be held responsible for critical decisions, such as the making of core assumptions, which lead to self-serving outcomes. The larger the number of people involved, and the greater the complexity of the forecasting procedures, the less likely it is that each participant in the process will feel morally responsible for the consequences.

4-2-3. Strategic optimism of demand forecasting

Wachs, interviewing public officials, consultants, and planners in the U.S., concludes that the cost overruns and patronage overestimates were not the result of technical errors, honest mistakes, or inadequate methods. In case after case, planners, engineers, and economists have had to "revise" their forecasts many times because they failed to satisfy their superiors. The forecasts had to be "cooked" in order to produce numbers and get the project started with federal support, whether or not they could be justified on technical grounds (Wachs, 1990, p 144).

Wachs also describes planners' conflicted position as "scientists" analyzing data objectively and as "advocates" revising data- for example, documenting positive facts without negative impacts, reconsidering assumptions to increase demand and enumerating indirect benefit enough to result in an excess of benefits over costs- in favor of client's preferred direction. (Wachs, 1989, pp476-477)

Skamris and Flyvberg, with the statistical dada shown in the Table 23, Table 24, and Table 25, argue that the difference between actual traffic demand and construction cost and their forecasts is consistently biased-underestimation of costs, overestimation of demand-and hence cannot be explained by the inherent difficulty in predicting the future. And being presented to parliament, other decision makers and the public, these misleading forecasts is likely to lead to misallocation of funds and poor performance of projects. (Skamris and Flyvberg, 1997)

And Flyvbjerg and others, in the same context of showing strategic optimism of public sector, even

though focusing on underestimation of costs from 181 projects collected worldwide with four year efforts as shown in the Table 28, conclude that in 9 out of 10 transportation infrastructure projects, costs are underestimated. This cannot be explained by error and seems to be best explained by strategic misrepresentation, i.e., lying. The use of deception and lying as tactics in power struggles aimed at getting projects started and at making a profit appear to best explain why costs are highly and systematically underestimated in transportation infrastructure projects. (Flyvbjerg et al, 2002, p 290)

Table 28: Inaccuracy of transportation project cost estimates by geographical location (fixed prices)

Project type	Europe			North America			Other geographical area		
	Number of projects (N)	Average cost escalation (%)	Standard deviation	Number of projects (N)	Average cost escalation (%)	Standard deviation	Number of projects (N)	Average cost escalation (%)	Standard deviation
Rail	23	34.2	25.1	19	40.8	36.8	16	64.6	49.5
Fixed-link	15	43.4	52.0	18	25.7	70.5	0	-	-
Road	143	22.4	24.9	24	8.4	49.4	0	-	-
All projects	181	25.7	28.7	61	23.6	54.2	16	64.6	49.5

Source: Flyvbjerg et al, 2002

With this regard, Bruzelius and others (1998) suggest that one of solution to deal with strategic misuse of demand forecasting is to involvement of private risk capital. In principle, the most important issue from an accountability point of view is the actual decision on whether to undertake the investment in a project or not. Government in itself is not sufficiently effective when it comes to enforcing accountability with respect to specific issues such as decisions on major infrastructure investments. A more effective way of achieving this is to let the decision to go ahead with a project-given the project satisfies agreed public interest objectives-be conditioned by the willingness of private financiers to participate in the project without a sovereign guarantee. (Bruzelius et al, 1998)

Furthermore, this strategic optimism also can be in the private sector. In many of the earlier road concessions, concessionaires have been either overly optimistic or overly aggressive in bidding,

leading to a host of restructuring and renegotiation. With a study on early concession programs in Chile, Gomez-Lobo and Hinojosa (2000) argue that private firms pursue this strategy for several reasons as follows[16]:

• When several projects are going to be concessioned, firms may be interested in giving low cost or aggressive behavior to other bidders in order to discourage some competitors from participating in furture contests.

• When construction firms are often the key consortium partner, construction contracts rather than the subsequent operation of the concession are the dominant interest, and bidding below cost secures the construction contracts, with disregard to the long-term financial viability of the concession, which will be the problem of the other consortium members or the creditors.

• Firms may bid low just to win the franchise with the expectation of future support from government in the possible renegotiating process. The governments will find it difficult to let the concession fail. Indeed, if the concession runs into financial problems in the future, associated political problems occur as well as costs and delays in re-tendering the project. Therefore, bidding low and renegotiating afterward may be a viable strategy for a potential concessionaire (a phenomenon called "lowballing").

• Finally, one cannot rule out optimization mistakes on the part of bidders, possibly related to poor assessment of demand uncertainty ("winner's curse"), or the complexity of tendering mechanisms.

Even though this optimism pointed out by Gomez-Lobo and Hinojosa can be eliminated in the establishment of explicit regulatory regime in terms of risk allocation, it is important part the regulator should remember to deal with privatization process, in that private firms' behavior could be unreasonably strategic even assuming fatal risks otherwise retained by the government.

[16] Gomez-Lobo and Hinojosa, 2000, pp9-10

4-3. Demand risk allocation comparison

As implied by Bruzelius and others (1998), the private firm's participation in concession program at their own risks could be a solution to eliminate the possible strategic optimism in development of large infrastructure. But, as explained in Chapter 2, not all risks are the same and therefore must not be borne by the same entity. And care must be taken to ensure that an entity carrying a given risk possesses the incentive to do.

If the public authority seeks to persuade concession companies to take certain risks, which they are unable to control, this will prolong negotiations and increase the level of remuneration demanded by the investors. If, on the other hand, the concession company seeks to disengage itself from purely technical or principally commercial or financial risks at the expense of the government, the utility of the concession should be re-examined. The transfer of risk from the public authority to the concession company enhances productive efficiency (French Highway Directorate, 1999)

In practice, actual regulatory regimes for risk allocation and incentives vary significantly from one country to another. In chapter 2, Table 1 shows an example of the diversity of risk allocation including future demand risk (commercial risk) allocation practiced between concession companies and concession authorities in Europe. As shown in the Table 1, the commercial risks are mainly transferred to concession companies. In Europe, 8 countries including France, the commercial risk is borne by the private participants in the road concession program. And 3 countries including England under shadow toll system, the demand risk is also borne by the concession company even though the risk is substantially supported by the public sector.

With this regard, this chapter is to compare the two mechanisms–shadow toll mechanism in the UK and minimum guarantee mechanism in Korea-in details in terms of demand risk allocation.

4-3-1. Risk shifting of demand forecasting in UK[17]

Payment Mechanisms - Shadow Toll Payment Mechanism

The Highways Agency pays each DBFO Co an amount, which is based on the number and type of vehicles using the road, with adjustments made for lane closure and safety performance. These are known as "shadow tolls" as opposed to real tolls, as payment for usage is made by the Highways Agency rather than by the road user. The payment is based on the following three criteria:

Usage/Demand: Shadow toll payments are made per vehicle using a kilometer of the project road, in accordance with the tolling structure and increase over time in accordance with an indexation formula. Different payments are due for traffic within different traffic bands and dependent on the length of vehicle. Bidders were asked to bid the parameters of traffic levels for a maximum of four, and a minimum of two, bands, with the proviso that the top band – anything exceeding X vehicle kilometers p.a. – must have toll levels set at zero to ensure that the maximum liability of the Agency under the DBFO contract is capped. Bidders set the bands and tolls from their own assessment of traffic levels. Most bidders opted for four bands with the lowest band representing a cautious view of traffic and tolls within that band set at a level that would cover debt service requirements (but would not provide a return on equity). Figure 5 shows a typical banding structure proposed by bidders.

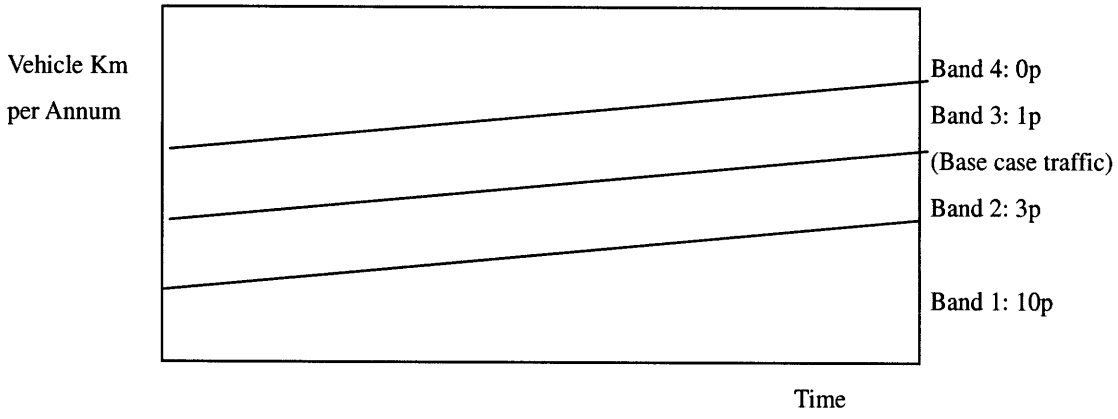
Availability of Service: Where the project road consists of an existing stretch of road with one or more construction schemes along its length, then shadow toll payments will be made at a reduced level representing the cost and operation for the existing road.

Performance: Two elements-safety and lane closure-form the basis of performance payments. The concession company is encouraged to suggest safety improvement schemes with incentives for

[17] In part or in whole, this chapter is directly quoted from The Highways Agency in UK, 2003a and 2003b.

improving safety on the Project Road. If approved, the concession company constructs and pays for the scheme and is recompensed by receiving 25% of the economic cost of each personal injury accident avoided in the following five year period. And a deduction is made from the toll payment when lanes are closed. The size of the deduction is dependant upon the number of lanes closed, the duration of the closure, the expected traffic at the time of the closure and the economic value of user delay. Lane closures charges are only made for closures within the control of the concession company.

Figure 5: Typical banding structure proposed by bidders



Source: The Highways Agency in UK, 2003a

Traffic risk allocation

The number and type of vehicles using a road affect the cost of constructing a road with a reasonable life expectancy, and the cost of maintaining it to the required standard. The Agency has its own traffic projections for the project road, which are updated forecasts based on traffic models devised for the initial investment decision for individual road schemes within the DBFO (Design-Build-Finance-Operate) project. The updated traffic forecasts are kept confidential. The Agency developed a probability distribution for traffic based on analysis of actual traffic against traffic forecasts for a large number of different schemes. The Agency's updated forecasts were used during

evaluation to calculate how much risk each bidder's payment structure would place on its revenue stream at the Agency's 'most likely' traffic forecast.

The Agency's forecasts are kept confidential to encourage the bidders to take their own view of traffic growth. The Agency provides the underlying data such as the existing traffic counts, to facilitate bidders' forecasts. If the Agency had disclosed its forecasts the bidders might not have put the same emphasis on forming their own view of traffic.

Bidders whose traffic forecasts underestimated traffic, compared with the Agency's forecasts, attached little risk to the payment stream, resulting in poor value for money. Bidders which overestimated traffic growth and weighted return in the higher bands, attached more risk to the payment stream and therefore provided better value for money. A bidder's assumptions on traffic growth may be so optimistic that, in the Agency's view, the proposed structure is financially unstable.

The Agency carried out an analysis of the risks attaching to a project by drawing up a risk register setting out in detail the risks relevant to each stage of the project, the likelihood of those risks occurring and an estimate of the financial impact of occurrence. This analysis helped the Agency to establish what type, and the quantum, of risk that they should ask the private sector to take. The DBFO contract is drafted so that concession company bears all risks associated with an area of delivery, such as operation, unless the Agency is specified to take a risk, either through the payment mechanism, change mechanism, termination events or other contractual mechanisms. Therefore any unanticipated risk will be borne by the private sector.

Advantage and disadvantages of Shadow toll mechanism

In general, shadow toll system has disadvantages as well as advantages compared with other types

of concession or budgetary projects as follows[18]:

• The main advantages of a conventional toll concession contract, namely optimization of the infrastructure with the risks and interim funding carried by the concession company, are maintained with a shadow toll system;

• there is no tendency to shift traffic onto other roads;

• no expenses associated with toll collection are incurred[19];

• the spreading of financial charges over a period of time makes it possible to attenuate the constraints of annual programming;

• but, a shadow toll system does not solve the funding problems, as the concession authority must pay shadow toll remuneration to the concession company in due course. A shadow toll contracts does not therefore generate new funding source. Such an arrangement makes it possible to shift responsibility for the financial package onto the concession company (so that the debt is non-public), but the final cost must be borne by the tax-payer ("delayed" budgetary funding), and not the user. The financial and legal costs of this type of arrangement can be high, and should not be underestimated. By comparison with budgetary funding, the shadow toll method also highlights an apparent increase in financial expenses (due principally to the return on invested capital required)

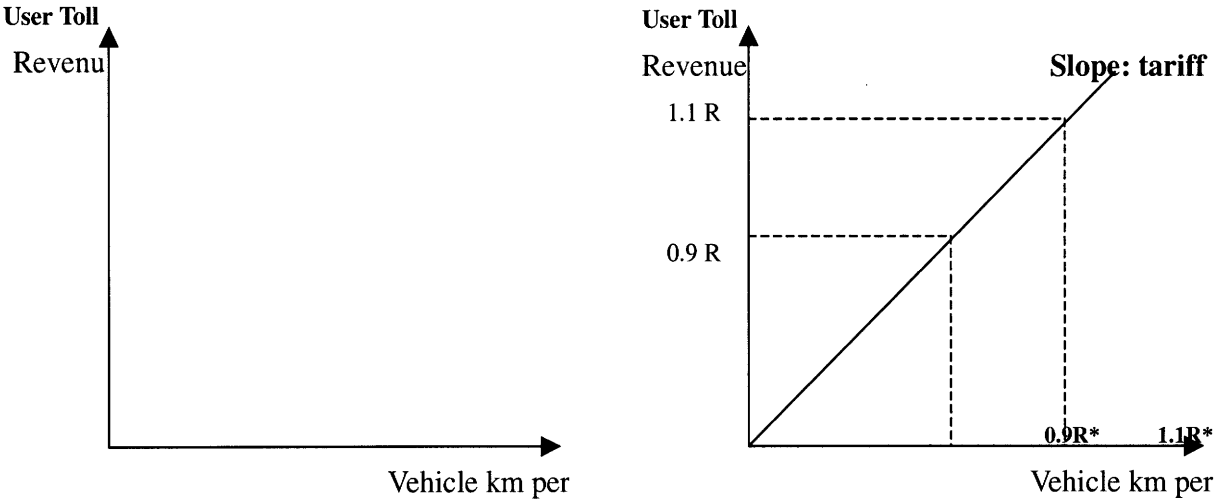
[18] The World Bank, 2001

[19] Approximately 10 to 15% of revenue are absorbed by toll collection costs, and about 10% of the initial cost of the infrastructure represents construction of the toll stations.

4-3-2 Demand risk allocation comparison (1)

In shadow toll mechanism, because government (or other public authority) pays tolls to the concession company, the roads are free for users. In minimum guarantee mechanism, the concession company collects tolls from the users. The total annual toll revenue can be calculated by Vehicle km per annum multiplied by tariff. And this relationship is showed in the Figure 6

Figure 6: Comparison of user toll revenue



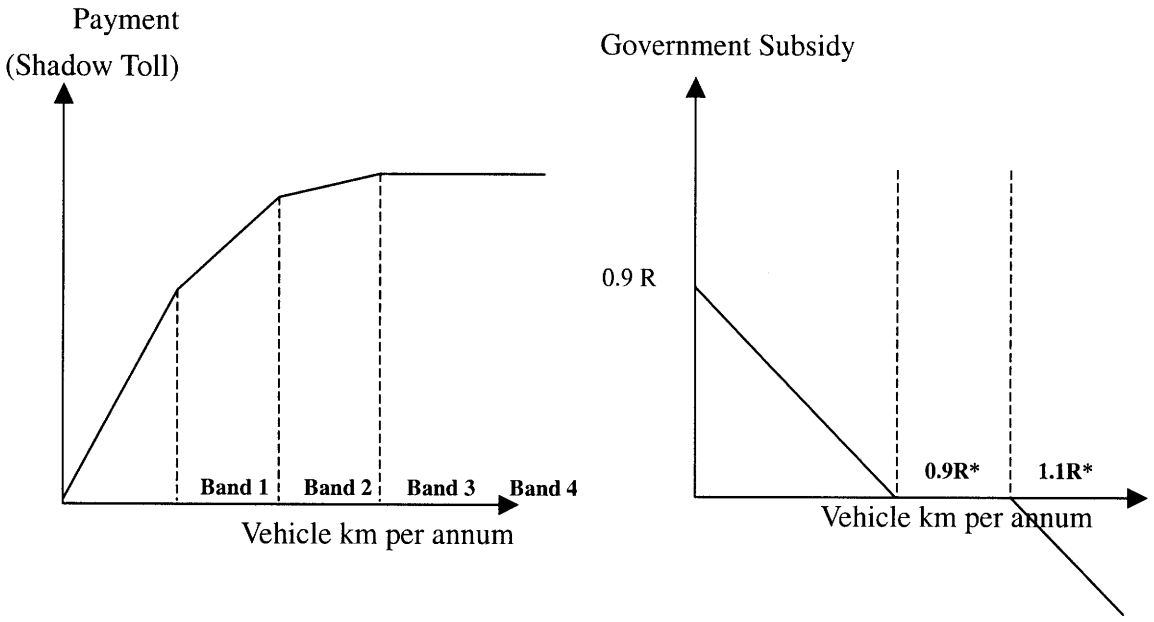
A. Shadow toll mechanism B. Minimum guarantee mechanism

Source: Adopted from French Highway Directorate, 1999 & PIMA, 2002

In shadow toll mechanism, the government remunerates the concession company based on the banding structure of the concession. Figure 7 shows annual government payment according to vehicle km per annum. This graph, to simplify, is based on the Figure 5(Typical banding structure proposed by bidders), without considering adjustment of safety and performance.

In minimum guarantee mechanism, it is assumed that the government guarantees 90% of the estimated operation revenue. When the actual operation revenue exceeds 110% of the estimated operation revenue the State redeems the excess revenue as shown in the Figure 7.

Figure 7: Comparison of cash flow from government



A. Shadow toll mechanism **B. Minimum guarantee mechanism**

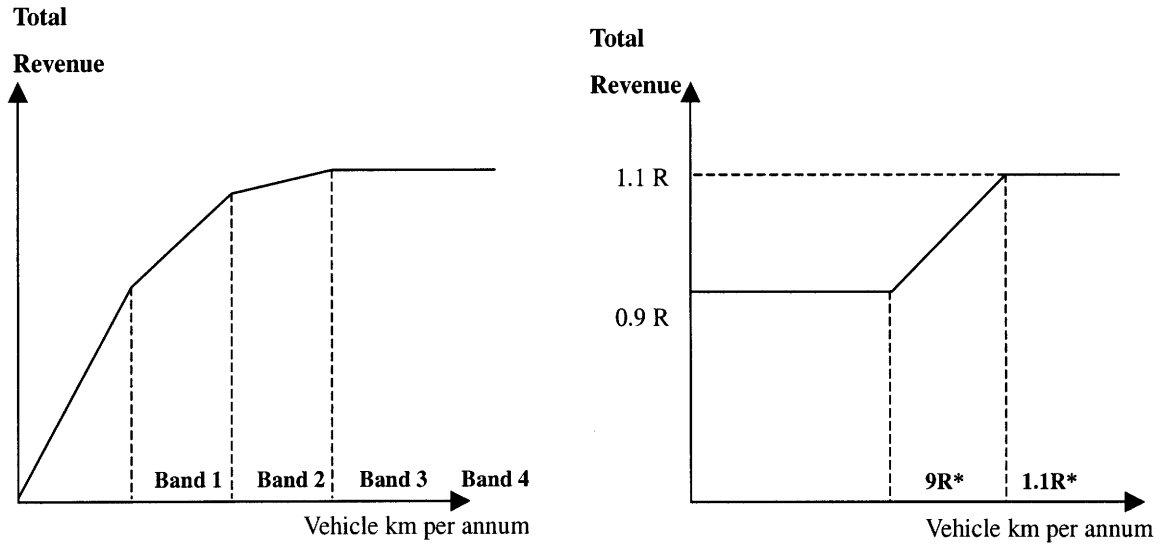
Source: Adopted from French Highway Directorate, 1999 & PIMA, 2002

Then, the Figure 8 shows aggregated revenue pattern for concessionaire, which is drawn by overlapping the Figure 6 and Figure 7. In both cases, the revenue of the concession company is limited. In case A, total remuneration of the concession company is capped, as there is no further payment above a certain traffic level (band 4) and in case B, toll revenue of concession company is also capped, because the excess above 110% of estimated revenue should be redeemed by the government.

In case A, even though passenger demand risk is transferred to the concession company as mentioned in the 4-3-1, the initial steeper slope of total revenue corresponding to lower vehicle km per annum could be recognized as a government support in case of lower passenger demand in the typical banding structure of shadow toll system; the slope decreases with increasing actual passenger demand. But, in case of B, risk of lower passenger demand is totally retained by the

government with the steady slope below 90% of estimated passenger demand, which reduce private firm's incentive to screen the concession project; especially the passenger demand risk.

Figure 8: Comparison of total revenue



A. Shadow toll mechanism **B. Minimum guarantee mechanism**

Source: Adopted from French Highway Directorate, 1999 & PIMA, 2002

4-3-3 Demand risk allocation comparison (2)

Endogenous demand forecasting in shadow toll mechanism in UK

As explained in 3-3-1, in the UK, the concession company made its own demand forecasts based mainly on the information released from the concession authority. Then, based on the result, the concession company proposes a banding structure for tariff to recover its investment. In this process, the demand forecasts of potential bidders could be implemented in various ways with probably different emphases and perspectives at the risk of its future cash inflow.

However, when it comes to demand forecasting, shadow toll system is different from other tolling

systems because, in shadow toll system, the roads are free for users and hence there is no tendency to shift traffic onto other alternatives to avoid toll cost as mentioned in 4-3-1. One of the complex problems to consider in demand forecasts in context of privatization, which is mentioned in 4-2-2, is solved automatically. This is one of the unique characteristic-one of the advantages-of shadow toll mechanism the regulator should understand in reviewing shadow toll system, designing traffic demand risk allocation and its compensation.

Exogenous demand forecasting in minimum guarantee mechanism in Korea

As mentioned in 3-2-3, in Korea, the preliminary feasibility study and detailed feasibility study of a given large infrastructure projects are prepared by public research institutes such as Korea Development Institute (KDI), Korea Research Institute for Human Settlements (KRIHS), Korea Transport Institute (KOTI), and etc. In other words, the demand forecasting is done by exogenous entities rather than by concessionaire.

Then, the potential bidders are required to screen and justify the demand forecasts of a given projects to mainly decide whether to participate in the project or not. In this process, government's guarantee of up to 90% of expected revenue (tariff × demand) significantly reduces incentive of private firms to screen the demand forecasts due to certain confidence of future revenue to the degree of government guarantee allowed. The success of the project depends primarily on accuracy of demand forecasts from the public institutes. But, as discussed earlier, one cannot rule totally out the strategic optimism of demand forecasts in the public and private sector, and cannot expect private sector's desperate efforts to screen the feasibility at the risk of recovery of private fund investment under significantly reduced incentive in this regime (PIMA 2002).

Theoretically, even minimum revenue mechanism could be efficient to attract private fund even in certain countries, provided that the accurate demand forecast could be guaranteed by other exogenous efforts rather than endogenous risk allocation in concession program. Nevertheless,

minimum guarantee mechanism (up to 90% of expected revenue) in the rate of return regulation regime has difficulty to deal with the problems discussed in this chapter, through risk allocation in concession program endogenously.

In this context, Engel and others argue that government guarantees for private infrastructure projects reduce the incentive of firms to perform efficiently, weaken the incentive to screen projects for white elephants, and shift government obligations to future periods. Thus the use of guarantees needs to be limited, and they need to be carefully designed (Engel et al, 1997, p 89). And they provide San Jose Logoon Toll Bridge in Puerto Rico as an example as follows:

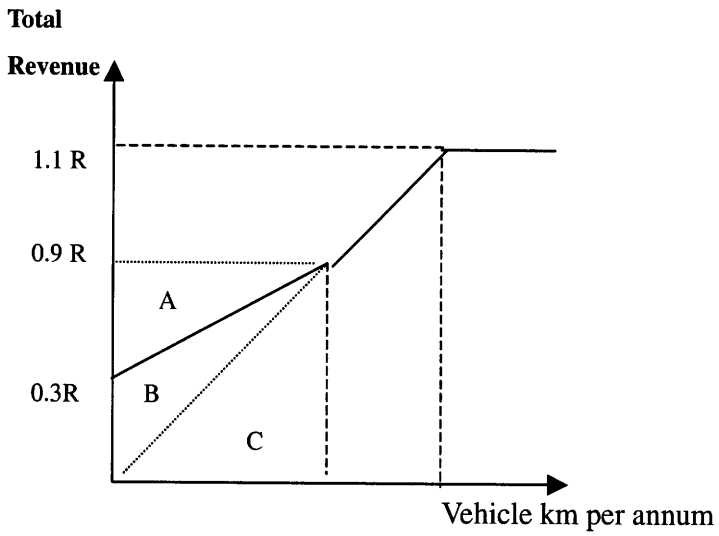
The San Jose Logoon Toll Bridge was built to relieve congestion in the San Juan region in Puerto Rico. The guaranteeing to buy bask the project at the concessionaire's request if traffic fell short of 80 percent of projections during the first three years and 100 percent of projections after nine years. In the event of a buy back, the government would reimburse the concessionaire for all project costs and pay it a 13 percent return on its investment. Under this badly designed guarantee scheme the concessionaire has few incentives to screen the quality of the project. (Engel et al, 1997, P93)

4-4. Strategic Implication

Theoretically, the minimum guarantee mechanism can be improved in some ways. The first option is to reshape the total revenue curve similar to that of shadow toll mechanism. This can be achieved from making the government guarantee increase gradually from the lower point (for example, 30%) than 90% of expected revenue to the 90% of expected revenue as shown in the Figure 9. In the Figure 9, solid line shows total revenue of a concessionaire; triangle C is toll revenue, and triangle B is cash flow from government guarantee. And triangle C is reduced government guarantee compared to the current mechanism in Korea in the Figure 8. This reduced government guarantee increases incentive for a concessionaire to screen the project feasibility at the risk of its investment, and also decreases the budgetary burden of the government. This strategic option can be done in

many ways, if one makes the total revenue curve similar to that of shadow toll mechanism and the Figure 9 shows a simple example of them.

Figure 9: Suggested Example of Government Revenue Guarantee



The second option is to improve the accuracy of demand forecasts done by public institutes. As mentioned in Chapter 3, MPB now is considering other private institute and private firms as well as PIMA for the needed expertise and higher objectiveness for the feasibility studies of large infrastructure projects. But, as discussed in the thesis, more effective way to deal with biased failure of demand forecasts in large infrastructure projects is to involve private participation at the risk of private investment in the project development. This option is exogenous method and is not as powerful and reachable as endogenous way such as the first option.

4-5. Summary

Frequent failures of demand forecasting in large transportation infrastructure projects are fairly biased toward overestimation. This cannot be explained by error and appears to be best explained by strategic misrepresentation of public sector. Under competitive process of public fund allocation

selecting some projects among a lot of projects proposed, the use of strategic optimism as tactics in power struggles for getting a project started seems to best explain why demand forecasting are systematically overestimated.

When the forecast is poorly estimated, it can lead to a considerable misuse of resources otherwise can support other feasible projects. And one of solution to deal with strategic misuse of demand forecasting is to involvement of private risk capital. Letting the decision to go ahead with a project given, through privatization, be made by the private participants at the risk of their investment is one of the solutions to deal with the strategic optimism of public sector.

Indeed, actual regulatory regimes for demand risk allocation and incentives vary significantly from one country to another. Among them, shadow toll mechanism in the UK transfers demand risks to private participants and gives higher incentive to them. Then, the concession company make its own demand forecast endogenously at the risk of its investment. The minimum guarantee mechanism in Korea makes traffic risks be retained by the government and gives lower incentive to private participants. In Korea, the preliminary feasibility studies and detailed feasibility studies are done by exogenous entities such as public institutes rather than by a concessionaire.

The discussion doesn't mean that the shadow toll mechanism is superior to minimum revenue guarantee mechanism. Both systems have their own advantages and disadvantages and selection and implementation of the regulatory regime could be based on unique situation of a country. Nevertheless, in Korea, the success of the project depends primarily on accuracy of demand forecasts from the public institutes and government's guarantee of up to 90% of expected revenue significantly reduces incentive of private firms to screen the demand forecasts due to certain confidence of future revenue to the degree of government guarantee allowed.

So, theoretically, the current minimum guarantee mechanism in Korea can be improved in two ways. The first is to reshape the total revenue curve similar to that of shadow toll mechanism. This leads

to increase incentive for a concessionaire to screen the project feasibility at the risk of its investment, and also decrease the budgetary burden for the revenue guarantee. The second is to improve the accuracy of demand forecasts done by public institutes, making competitive environment with introducing other private institute and private firms in the market. This option is exogenous method and is not as powerful and reachable as endogenous way such as the first option

Chapter 5. Conclusions

In many countries, transportation infrastructures and services have been managed by the public sector with budgetary fund. But, the public management has resulted in inefficiency, lack of creativity, extraordinary lifecycle costs. In addition, increasing demand of budget toward other sector such as social welfares, make it more difficult to finance the transportation infrastructure with budgetary funding. These problems have encouraged increasing private involvement in the sector to achieve creativity and efficiency from private entities. However, the worldwide experience has demonstrated that the government needs to assume new responsibilities such as creating competitive environment for the market under monopoly issue, allocating various risks fairly between the parties, selecting regulatory regime to control price and quality and to guarantee reasonable profit to a concessionaire, managing government support and organizing concession contract properly. Among them, the thesis focuses on the government's role to regulate demand risk allocation in large transportation projects.

In Korea, since 1994, policy decisions have been taken to introduce private capital in infrastructure with a concession scheme to alleviate its budgetary restriction of the government and allow more public resources to be devoted to other social spending as well as to achieve creativity and efficiency from private sector. Since then, the 128 projects with total cost of 40.6 trillion Won have been announced as PPI projects and the actual private fund investment has increased to occupy 9.6 % of total infrastructure investment in 2002. And the government also made the list of future PPI projects as a reference to manage the future PPI projects, which consist of 179 projects with total cost estimate of 63 trillion Won.

On one hand, such quantitative expansion of private fund investment has been appraised in terms of attenuating budgetary limitation and following allowance of investment in other social sectors, and on the other hand, qualitative results of PPI projects have been on debate due mainly to optimistic demand forecasts in hindsight and generous revenue guarantee as a reason.

In this regard, the government should understand strategic optimism of public sector about demand forecasts. Frequent failures of demand forecasting in large transportation infrastructure projects are fairly biased toward overestimation. This cannot be explained by mistakes and appears to be best explained by strategic misrepresentation of public sector. Under competitive process of public fund allocation selecting some projects among a lot of projects proposed, the use of strategic optimism as tactics in power struggles for getting a project started seems to best explain why demand forecasting are systematically overestimated. And when the forecast is poorly estimated, it can lead to a considerable misuse of resources otherwise can support other feasible projects.

One of solution to deal with strategic misuse of demand forecasting is involvement of private risk capital. Letting the decision to go ahead with a project given, through privatization, be made by the private participants at the risk of their investment is one of the solutions to deal with the strategic optimism of public sector.

Indeed, actual regulatory regimes for demand risk allocation and incentives vary significantly from one country to another. Among them, shadow toll mechanism in the UK transfers demand risks to private participants and gives higher incentive to them. Then, the concession company make its own demand forecast endogenously at the risk of its investment. The minimum guarantee mechanism in Korea makes traffic risks be retained by the government and gives lower incentive to private participants. In Korea, the preliminary feasibility studies and detailed feasibility studies are done by exogenous entities such as public institutes rather than by a concessionaire.

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confidence of future revenue to the degree of government guarantee allowed.

So, theoretically, the current minimum guarantee mechanism in Korea can be improved in two ways. The first is to reshape the total revenue curve similar to that of shadow toll mechanism. This leads to increase incentive for a concessionaire to screen the project feasibility at the risk of its investment, and also decrease the budgetary burden for the revenue guarantee. The second is to improve the accuracy of demand forecasts done by public institutes, making competitive environment with introducing other private institute and private firms in the market. This option is exogenous method and is not as powerful and reachable as endogenous way such as the first option

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Annex 1. Table of example 1 of risk allocation (Source: Estache and Strong, 2000)

Risk	Contractor	Operator	Equity	Lenders	Government	Insurance	Unallocated
Construction Phase							
1. Cost overruns/delays due to							
Design	*						
Engineering	*						
Construction	*						
2. Change in legal requirements							
Federal					*		
State					*		
Local					*		
3. Land acquisition					*		
4. Weather							*
5. Natural disasters							
Insurable						*	
Uninsurable							*
6. Industrial action							
Site specific	*						
General					*		
7. Environmental							
EIS breach	*						
Known or caused by state					*		
Other-major							*
Other-minor	*						
8. Civil disobedience							
Facility-related	*						
Other					*		
9. Traffic and activity relocation	*						
10. Insurance							
Fire						*	
Workers compensation						*	
Public liability						*	
11. Force majeure							*
12. Confiscation							
State					*		
Federal					*	*	
13. Approvals/licenses/permits	*						
14. Variations							
By government						*	
By contractor	*						
15. Interest rate risk			*	*			
16. Taxation	*		*	*	*		
17. Other tariffs and charges		*	*		*		
Operation Phase							
1. Revenue/Traffic/Demand			*	*	*		
2. Operation		*					
3. Maintenance		*					
4. Defects liability		*					
5. Natural disaster							
Insurable						*	
Uninsurable							*
6. Industrial action							

Site specific		*	*				
General			*		*		
7. Environmental							
Known or caused by state					*		
Other-major			*		*		
Other-minor			*				
8. Civil disobedience							
Facility-related		*					
Other					*		
9. Insurance							
Fire						*	
Workers compensation						*	
Public liability						*	
10. Force majeure							*
11. Confiscation							
State					*		
Federal					*		
12. Interest rate risk			*	*			
13. Taxation			*	*	*		
14. Other tariffs and charges		*			*		

Annex 2. Table of example 2 of risk allocation (Source: PICKO, 2001)

Risk	Allocation under PPI		
	Public sector	Shared	Private sector
1. Demand and revenue risks			
- Passenger demand		O	
- Fare levels		O	
- Development of Service Patterns			O
2. Operation risks (including maintenance)			
- Cost of operations			O
- New regulation		O	
- Fire			O
- Theft			O
- Accidental damage			O
- Vandalism (not covered by insurance)			O
- Health and safety costs			O
- Breach of environmental regulations			O
- Training costs			O
- Exchange rates			O
- Defects that require repair to maintain performance			O
- Integration of new assets into the system			O
- Replacement of major items of equipment			O
3. Design and construction cost			
- Site availability	O		
- Commissioning and systems integration			O
- Site costs	O		
- Inadequate design			O
- Design errors			O
- Late design changes			O
- Design delays			O
- Site access problems		O	
- Unforeseen ground conditions			O
- Environment			O
- Archaeological discoveries			O

- Weather		O	
- Strikes		O	
- Interference from third parties			O
- Interactions with utilities and statutory undertakers			O
- Noise restrictions			O
- Buildability			O
- Delays with procurement of materials			O
- Availability of plant			O
- Unproven technology			O
- System integration			O
- Delays with approvals			O
- Insolvency of subcontractors or suppliers			O
- Commissioning difficulties			O
- Contractual claims			O
- Abandonment of contract			O
- Construction defects			O
- Third-party liability			O
- Fire			O
- Flood			O
- Health and safety			O
4. Financial and economic risks			
- Inflation		O	
- Interest rate			O
- Exchange rate		O	
- Availability of private finance			O
5. Other risks			
- Taxation			O
- Change in legislation		O	

Annex 3. Article about government subsidy in the Act on PPI(Source: MPB, 2003)

ACT ON PRIVATE PARTICIPATION IN INFRASTRUCTURE

Article 53 (Financial Support) If it is necessary for the efficient implementation of construction projects of revertible facilities, the Central or local government may grant a subsidy or long-term loan to the concessionaire, only where prescribed by the Presidential Decree.

ENFORCEMENT DECREE OF THE ACT ON PRIVATE PARTICIPATION IN INFRASTRUCTURE

Article 37 (Financial Support)

(1) The State or local governments may grant any subsidy or long-term loan to the concessionaire within the scope of the budget after deliberation of the Committee, in the following cases under the provisions of Article 53 of the Act:

1. Where dissolution of the corporation is inevitable;
2. Where it is an inevitable measure to maintain the user fee at an appropriate level;
3. Where inducement of private capital is difficult due to a fall in the profitability of the project as a result of a considerable expenditure disbursed as compensation for the use of land;
4. Where the actual operational profit (referring to the amount obtained by multiplying the user fee by the demand for the concerned facility) falls considerably short of the estimated operational profit under the concession agreement, to such an extent that the operation of the facility is difficult;
5. Where it is difficult to actively conduct the private investment project without a long-term loan or subsidy prior to conducting projects which are low in profitability but which can considerably reduce the construction period or the cost of construction of other projects when conducted together with other private investment projects; and
6. Where the losses from exchange rate fluctuations occur, due to the excessive exchange rate fluctuation, in the borrowings in foreign currency for the construction funds which are raised by the project executor through outside capital.

(2) In granting a subsidy under the provisions of paragraph (1) 5, the State or a local government shall calculate the amount required for the implementation of the project concerned by applying the method of anticipating the price and the method of adjusting the contract amount under the provisions of Chapters 2 and 5 of the Enforcement Decree of the Act on Contracts to Which the State is a Party, or Chapter 7 of the Enforcement Decree of the Local Finance Act, and shall grant this within the limit of the amount calculated.

Annex 4. Determination of Rate of Return and Tariff (Source: MPB, 2000)

1. The rate of return and tariff of the private investment project shall be determined in accordance with the following formula:

$$\sum_{i=0}^{n} \frac{CC_i}{(1+r)^i} = \sum_{i=n+1}^{N} \frac{OR_i - OC_i}{(1+r)^i} + \sum_{i=0}^{N} \frac{ANR_i}{(1+r)^i}$$

n : time of completion of construction

N : time of expiration of concession period or period of ownership and operation (for the facilities subject to the permanent ownership of the private sector, this refers to assessment period)

CCi : annual input of the project cost required for the completion of construction of facilities--Government financial support shall be excluded herefrom.

ORi : annual operation revenue (annual operation cash inflow)

OCi : annual operation cost (annual operation cash outflow)

ANRi : annual net revenue cash inflow from supplementary project(s) (income – expenditure)

r : real rate of return of the project

The competent authority indicates in the instruction for proposal the base time for calculating the total project cost (*CCi*), operation revenue (*ORi*), operation cost (*OCi*), net revenue from supplementary project(s) (*ANRi*), etc., in constant price. Such base time may be re-determined at the conclusion of the concession agreement.

The competent authority indicates the construction period (*n*) and concession period or period of use and profit-making (*N-n*) in the instruction for proposal. The period of use for government reverted facilities may not exceed fifty (50) years.

2. Determination of the rate of return(*r*) for agreement

The proposer shall autonomously suggest the rate of return for agreement on the basis of the expected rate of return considering factors such as investment cost, operation revenue, finance procurement costs, etc. The proposer and the competent authority shall agree upon the rate of return through negotiations.

The following items may be taken into account in determining the rate of return for agreement:

•The average level of interest rate for borrowing from both domestic and international financial organizations with respect to infrastructure facilities

•The risk premium after taking into account the risks that can be expected from the project characteristics and its implementation such as the type, scale, security of operation revenue, revenue from supplementary facilities, the level of risk allocated to the Government, etc.

•Level of rate of return for similar private investment project cases domestically and internationally

The competent authority may consult with PICKO for its support when calculating and negotiating for the rate of return.

Ex post adjustment of the rate of return (r) agreed upon in the concession agreement is not permitted during project implementation.

3. Calculation of total project cost, etc.

3-1 Calculation of the total project cost ($\sum$CCi)

The total project cost refers to the costs for the establishment, expansion, and reformation of infrastructure facilities. The calculation consists of the following:

•Survey cost: Cost for the survey of the implementation of the project (based on the pricing standards for engineering projects under Article 10 of the Engineering Technology Promotion Act);

•Design cost: Cost for the design activities of the project (based on the pricing standards for engineering projects under Article 10 of the Engineering Technology Promotion Act or the rewarding standards for certified architects under Article 26 of the Certified Architect Act);

•Construction cost: Sum of material cost, labor cost, general expenses, management cost and profits for the implementation of the project [based on the estimation and pricing standards and unit price under Article 9 of the Enforcement Decree of the Act on Contract to which the State is a party (this refers to the price announced by the government, if any)];

•Compensation cost: Cost for purchase of lands (including cost for purchase of buildings and trees), resettlement of local residents, and compensation for trading, fishing and mining rights for the implementation of the project;

•Incidental cost: All costs including cost for feasibility study, environmental impact assessment, and supervision, and financial costs incidental to raising financial resources. (Applicable only towards incidental financial costs where specific financing plan has been concluded in agreement)

•Equipment operation cost: Cost for materials and equipment invested for the first time for operation of facilities;

•Taxes and public utility rates: Taxes including acquisition tax, registration tax, and VAT on the implementation, completion, registration of the project and transfer of ownership, and others levied by the Acts; and

•Reserves for operation: Necessary expenses for operation of facilities such as cost for establishing a corporation and cost of starting a project.

Total project cost set forth in the concession agreement shall not be adjusted, except in the following events:

•where it is deemed necessary to adjust the total project cost according to price level, due to significant price fluctuations during the construction period;

•where it is practically impossible to determine the construction cost, etc., in the concession agreement (In such a case, the concession agreement shall indicate the timing, procedure and method of determining the total project cost.); or

•other force majeure where there occurs an inevitable circumstance(s) to adjust the total project cost, as determined by the concession agreement.

3-2 Calculation of operation cost ($\sum$OCi)

Aggregate sum of the cost required for the operation of the facilities, including, but not limited to, the cost of repair and reformation, corporate tax, etc., incurred during the operation period after completion of construction.

Financial cost and depreciation (including redemption cost for the incorporation cost, initial operation cost, goodwill, etc.) shall not be included in the calculation of operation cost as separate

items since financial cost is reflected in the real rate of return and depreciation is compensated by the recovery of total project cost during concession period.

3-3. Calculation of net revenue from supplementary project ($\sum$ANRi)

Net revenue from the supplementary project(s) excluding the costs, includes all revenue and cost from the implementation of the supplementary project(s) up to the time such revenue occurs.

4. Filing and Adjustment of Initial Tariff and Annual Tariff

The concessionaire shall determine and report the initial tariff for the first year of operation to the competent government pursuant to tariff adjustment method set forth in the concession agreement, e.g., the reflection of the consumer price fluctuation rate during construction period.

The concessionaire shall determine and report the annual tariff subsequent to initial year of operation to the competent government pursuant to tariff adjustment method set forth in the concession agreement, e.g., the reflection of the consumer price fluctuation rate of the previous year.

In accordance with the method stipulated in the concession agreement, the concessionaire shall report the figure for the tariff to the competent authority no later than sixty (60) days prior to the collection of tariff, along with the documents indicating the following:

- •method of use and the rate of tariff:
- •basic documents of calculation;
- •collection method;
- •the rate of reduction, exemption or extra charges of tariff as well as the parties to which they shall apply;
- •the level of tariff for similar facilities; and
- •other necessary matters with regard to tariff.

In the event that the method of use and tariff of the facilities determined by the concessionaire are considered significantly detrimental to the convenience of the user(s), the competent authority may adjust the said method of use, tariff and other matters necessary for the management and operation of the facilities, upon consultation with the concessionaire.